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Quality of Life and its Determinants Among Allogeneic Haematopoietic Stem Cell Transplantation Patients and the Finnish Population

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QUALITY OF LIFE AND ITS DETERMINANTS AMONG ALLOGENEIC HAEMATOPOIETIC STEM CELL TRANSPLANTATION PATIENTS AND THE FINNISH POPULATION

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Abstract

The present study explores, for the first time in Finland, the global quality of life, the health-related quality of life, and associated factors among allogeneic haematopoietic stem cell transplantation (SCT) patients, as well as problems and stressful issues related to blood diseases and allogeneic SCT. Furthermore, the global quality of life and its determinants are also studied among the Finnish population. This cross-sectional study is based on two data sets, one representing all the allogeneic SCT patients transplanted at Helsinki University Central Hospital in 1988-1997 the other representing the Finnish population (FINNRISK -97).

The results of this study support the premise that most of long-term allogeneic SCT patients express satisfaction with their global quality of life and describe themselves as living without significant physical, functional, emotional, and social problems related to their disease or SCT treatment. However, a small proportion of the patients examined herein continued to have physical problems even years after the SCT. Depending on the symptom evaluated, from one to eight per cent of the patients often or very often experienced some physical symptoms.

It was found out that physical well-being, educational level, age at SCT, and social support had an effect upon the global quality of life among the SCT patients. However, the effect was related to follow-up time. During the first three years since the SCT, physical well-being was the most important determinant of the global quality of life. It was also found that those undergone the transplantation at the age of more than 40 years were more satisfied with their life than those undergone the procedure under 40 years of age, respectively, when the follow-up time was from one to three years. Thus, patients receiving a transplant at a younger age appear to need more emotional guidance and counseling.

On an average, physical well-being was shown to improve after the first year since the transplantation. However, the present results indicated that important gender differences exist among allogeneic SCT recipients, which need to be addressed to when designing post-treatment intervention programs for SCT recipients. The females indicated more tiredness and sleeping difficulties and were less often satisfied with their sexual life than the males.

Stress factors were studied using concept mapping methodology. The analytic method employed captures direct patient perceptions, allowing the patient to define the domains under investigation. Eight primary stress clusters were revealed. "Change of life and long lasting treatment"; "side-effects", and "distress related to treatment outcome and physiological status" were perceived the most stressful dimensions." During the treatment also "worries about the well-being of the family" and "excitement related to blood counts" were perceived highly stressful. Some of the stressors generated by the patients were unique and gave important inside information to be used in clinical settings.

Among the Finnish population good perceived health, good functional status, satisfaction with family life, with life achievements, with economical situation as well as lack of depressive symptoms and anxious mood indicated good global quality of life. The results regarding the relationship between the global quality of life and its dimensions suggest that the emotional state should not be studied as one independent dimension of the quality of life but, rather, as a mediator variable greatly influencing the process how causal indicators of the quality of life are translated into the global quality of life.

Tiivistelmä

Tässä työssä tarkastellaan ensimmäistä kertaa Suomessa allogeenisen kantasolujensiirron läpikäyneiden potilaiden yleistä ja terveyteen liittyvää elämänlaatua sekä kuvataan hematologisiin sairauksiin ja kantasolujensiirtoihin liittyviä psykososiaalisia ongelmia ja stressitekijöitä. Lisäksi tutkitaan yleisen elämänlaadun tekijöitä ja näiden tekijöiden välisiä yhteyksiä suomalaisväestössä ja kantasolujensiirtopotilailla. Poikkileikkaustutkimus perustuu kahteen aineistoon. Ennen vuotta 1997 allogeenisen kantasolujensiirron läpikäyneet potilaat muodostivat ensimmäisen aineiston (n=109). Toinen aineisto on vuonna 1997 tutkittu 25-64 vuotiaiden suomalaisten otos (FINRISK, n=3838).

Tutkimuksen tulokset tukevat johtopäätöstä, että suuri enemmistö kantosolujensiirron läpikäyneistä potilaista on tyytyväisiä elämäänsä ja elää ilman merkittäviä terveyteen, toimintakykyyn, tunne-elämään ja sosiaaliseen elämään liittyviä ongelmia. Kuitenkin pieni osa potilaista kärsii terveysongelmista jopa vuosia kantasolujensiirron jälkeen. Yhdestä kahdeksaan prosenttiin prosenttiin potilaista ilmoitti kärsivänsä jostakin terveyteen liittyvästä ongelmasta usein tai hyvin usein.

Fyysinen hyvinvointi, koulutustaso, kantasolujensiirron aikainen ikä ja sosiaalinen tuki vaikuttivat siirtopotilaiden yleiseen elämänlaatuun. Vaikutus elämänlaatuun riippui seuranta-ajasta. Ensimmäisen kolmen vuoden aikana terveys oli keskeisin yleisen elämänlaatua määräävä tekijä. Kun siirrosta oli kulunut vuodesta kolmeen vuoteen ne, jotka olivat käyneet siirron läpi yli 40-vuotiaina, olivat tyytyväisempiä elämäänsä kuin alle 40-vuotiaina toimenpiteen läpikäyneet.

Terveyteen liittyvä fyysinen ja psyykkinen elämänlaatu parani keskimäärin vuoden kuluttua siirrosta. Tutkimus antoi viitteitä myös siitä, että miesten ja naisten välillä on eroja terveyteen liittyvässä elämänlaadussa. Naisilla oli useammin väsymystä, nukkumisvaikeuksia ja he olivat harvemmin tyytyväisiä sukupuolielämäänsä kuin miehet. Ruumiillista työtä tekevillä oli siirron jälkeen vaikeampaa työllistyä kuin toimistotyötä tekevillä. Ruumiillisen työn tekijät ilmaisivat myös suurempaa kuntoutuksen tarvetta.

Stressitekijöiden tutkimisessa käytettiin käsitekartoitusmenetelmää. Menetelmä valittiin, koska se ei rajoita mahdollisten vastausten määrää. Potilaat kertoivat mitkä tekijät he olivat kokeneet stressiä aiheuttaviksi sairauden ja hoidon aikana. Menetelmän avulla löydettiin kahdeksan ulottuvuutta, jotka kuvasivat sairauden ja hoidon vaikutuksia elämän eri osa-alueilla. Voimakkaimmiksi stressitekijöiksi potilaat arvioivat 'elämän muutokseen ja pitkään hoitoon' liittyvät tekijät. Huoli perheenjäsenten hyvinvoinnista ja veriarvojen seuranta nousivat myös tärkeiksi hoidonaikaisiksi stressitekijöiksi.

Väestöaineistossa parempaan yleiseen elämänlaatuun olivat yhteydessä hyvä koettu terveys, hyvä toimintakyky, tyytyväisyys perhe-elämään, taloudelliseen tilanteeseen ja elämän saavutuksiin sekä depressiivisten oireiden ja ahdistuneiduuden puute. Monimuuttujamenetelmiä käytettäessä havaittiin, että tunne-elämän tekijöillä oli merkitsevästi suurempi vaikutus yleiseen elämänlaatuun kuin muilla tekijöillä. Näiden tulosten perusteella voidaan päättellä, että emotionaalinen hyvinvointi välittää elämänlaadun osatekijöiden (esim. terveys, talous, sosiaaliset suhteet) vaikutuksen yleisen elämänlaadun kokemukseksi.

Tutkimuksessa osoitettiin myös miten eri tekijät pitkän toipumisprosessin eri vaiheissa vaikuttivat yleisen elämänlaadun kokemiseen. Nämä tulokset vahvistivat olettamusta elämänlaadun kokemuksen tilanneriippuvuudesta.

Havainnot potilaiden elämänlaatuun vaikuttavista tekijöistä ja potilaiden omakohtaiseen kokemukseen perustuva ongelma-alueiden kartoitus ja arviointi voivat auttaa hoidosta vastaavia edistämään potilaiden elämänlaatua.

List of the original articles

The thesis is based on the following original articles which are referred to in the text by their Roman numerals:

I. Heikki Heinonen, Liisa Volin, Antti Uutela, Michael Zevon, Chris Barrick and Tapani Ruutu. Quality of life and factors related to perceived satisfaction with quality of life after allogeneic bone marrow transplantation. Annals of Hematology 2001;80(3):137-43.

II. H. Heinonen, L.Volin, A. Uutela, M. Zevon, C. Barrick and T. Ruutu. Gender-associated differences in the quality of life after allogeneic BMT. Bone Marrow Transplantation 2001; 28:503-509.

III. Heikki Heinonen, Liisa Volin, Michael A. Zevon, Antti Uutela, Chris Barrick and Tapani Ruutu. (2005) Stress among allogeneic bone marrow transplantation patients. Patient Education and Counseling, 56, 62-71.Published online.

IV. Heinonen H, Aro AR, Aalto AM, Uutela A. Is the evaluation of the global quality of life determined by emotional status? Quality of Life Research. 2004;13:1347-56. *Erratum* to appear in Quality of Life Research July, 2005.

Abbreviations

AA	Aplastic anaemia
ADL	Activities of the daily living scale
AML	Acute myeloid leukaemia
ALL	Acute lymphatic leukaemia
ANCOVA	Univariate analyses of covariance
BDI	Beck Depression Inventory
BMT	Bone marrow transplantation
cGVHD	Chronic graft versus host disease
CM	Concept mapping
CML	Chronic myeloid leukaemia
EBMT	The European Group for Blood and Marrow Transplantation
EORTC	European Organization for Research and Treatment of Cancer
FACT	Functional Assessment of Cancer Therapy scale
GQOL	Global quality of life
HRQOL	Health-related quality of life
MDS	Myelodysplastic syndrome
MM	Multiple myeloma
MOS SF-36	Medical Outcomes Study 36-Short-Form Health Survey
NHL	Non-Hodgkin lymphoma
NHP	Nottingham Health Profile
PV	Proportion of variance
QOL	Quality of life
QLQ-C30	Quality of Life Questionnaire
SCT	Stem cell transplantation
SIP	Sickness Impact Profile
SSQ6	A Brief Measure of Social Support
SPSS	Statistical Package for the Social Sciences
STAI	State anxiety scale
WHO	World Health Organization

1. Introduction

Haematopoietic stem cell transplantation (SCT) is a high-risk, elective, potentially curative procedure offered to patients with haematological diseases. With increasing knowledge and experience and current protocols 40-80 % of the patients become long-term survivors (Ruutu, 2000). Therefore, the psychosocial consequences and quality of life (QOL) of SCT recipients have continuously become more important.

The present study is the first in Finland investigating the QOL among patients undergone allogeneic haematopoietic SCT.

In order to enhance the well-being of allogeneic SCT patients the present study investigated the global quality of life (GQOL), the health-related quality of life (HRQOL), and stress among patients undergone allogeneic haematopoietic stem cell transplantation (SCT). Concepts of the GQOL, HRQOL, and disease- and treatment specific QOL have rarely been discussed in a single study before.

The determinants as well as the relative importance of different dimensions are likely to vary across people, situations, and time. In order to study the relativity of the determinants of the GQOL and the conceptual correspondence across the results and the measures the scope of the study population was widened to include a population sample.

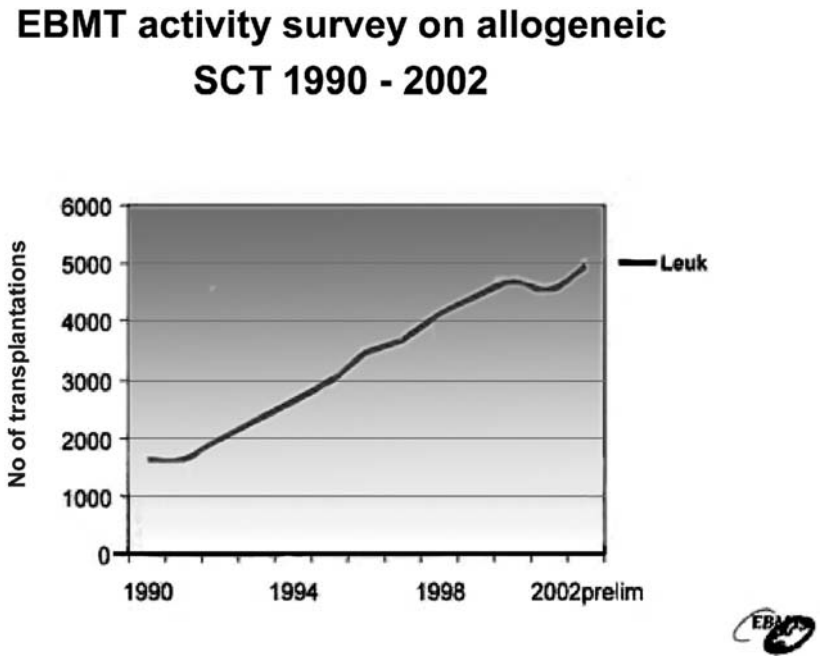
1.1 Haematopoietic stem cell transplantation

Allogeneic SCT has been increasingly used over the last two decades in the treatment of various haematological malignancies and a few immune disorders. It has become an important mode of treatment especially in leukaemia as shown in an annual survey of European countries by the European Group for Blood and Marrow Transplantation (Fig. 1, Gratwohl et al., 2004).

Allogeneic SCT is one of the most intensive treatments used for any disease and it often provides the best chance of cure of a malignant disease. Allogeneic SCT is defined as an infusion of haematopoietic stem cells collected from a healthy donor with the intention of replacing the existing diseased haematopoiesis of the patient by the infused stem cells. The infusion is preceded by a conditioning regimen aiming at immunosuppression and

tumour cell killing. The best results are achieved when the donor is human leukocyte antigen (HLA) compatible, either a sibling or an unrelated registry donor. Survival rates depend largely on type of disease, phase of disease, type of SCT, time between diagnosis and SCT, age at SCT (Anasetti et al.1990). The stem cells are collected either from the bone marrow (bone marrow transplantation, BMT) or peripheral blood of the donor.

Figure 1



Reprinted by permission from Bone Marrow Transplantation,Gratwohl et al.,2004, Macmillan Publishers Ltd.

Due to the intensity of the treatment, the patient has to be in a good condition, younger than 55-60 years, and the tumour burden of the malignant disease reduced to a minimum at the time of transplantation to get favourable treatment results. Allogeneic SCT represents an example of modern high-efficiency medical technology and requires highly trained physicians and nurse specialists. Therefore, in Finland the procedure is centralized. All allogeneic transplantations in Finland, except those in the district of Turku University Hospital, are performed at Helsinki University Central Hospital.

During the study period the patients were hospitalized for approximately six weeks in single isolation rooms for the transplantation procedure. During the hospitalization the patients are very vulnerable to infections for a period of two to three weeks because of low white cell counts. During that time the patients usually have infections and need treatment with antibiotics. Due to mucosal damage of the mouth, the patients are often unable to eat and gain enough calories without intravenous alimentation. When the infused stem cells of the donor have increased in number and the cytopenias subsided, most of the acute-phase complications of the patient are overcome. After hospitalization the patients can stay at home. The procedure requires immunosuppressive treatment for nine to 12 months after the SCT and frequent outpatient visits during this period. The patients visit the outpatient clinic first weekly for three to four months, then twice a month for a couple of months, and thereafter once a month. From nine to 12 months after the procedure all transplantation-related medication can usually be tapered off. In this respect the SCT differs from solid organ transplantations after which immunosuppressive medication associated with severe side-effects (Claas, 2003) and causing decrease in the QOL over time (Barr et al., 2003) is needed continuously after transplantation.

The main complications of allogeneic SCT are infections, graft-versus-host disease (GVHD, the main targets of which are skin, gut, and liver), and recurrence of the primary disease (Ruutu, 2000). Whenever problems arose the patients were readily re-hospitalized. The overall survival at five years after allogeneic transplantation was 80 % in chronic myeloid leukaemia and 60 % in acute myeloid leukaemia which were the two main indications for transplantation during the time of the study. At that time allogeneic transplantation was the only way to cure chronic myeloid leukaemia. On the other hand, transplantation-related mortality was 20-25 % depending on the disease of the patient as well as on the toxicities of the treatments needed prior to transplantation.

Although several studies have reported good functional well-being among long-term allogeneic SCT survivors with the majority of the recipients returning to work or school (Schmidt et al.,1993, Bush et al., 1995, Syrjälä et al., 1993), physical, social, and psychological concerns can persist even after a successful completion of the procedure (Andrykowski et al., 1995a, Broers et al., 2000, Greenberg et al., 1997).

In order to develop treatment strategies and improve treatment results it is essential also to study the QOL of the patients and to find determinants influencing the QOL after the SCT.

1.2 Quality of life

What is the quality of life? ‘Quality’ implies the degree of excellence of a characteristic. To define quality, one needs to have a standard which is measurable. However, there is a widely accepted problem in the field of QOL research concerning the lack of 'gold standard', because there is no external criterion of the QOL against which measures could be tested (Hunt, 1997). According to Hunt (1997), the problem exits mainly "because the quality of an individual's life is bound up with so many dynamic and complex interactions and idiosyncratic personal values that the notion of an 'average' QOL is a nonsense."

The theoretical definitions of the related concepts of happiness, well-being, the ‘good life’, and the QOL arouse much conceptual confusion and preoccupy a wide range of disciplines,, dating back to the early Greek philosophy (Aristotle, 384–322 BC; Veenhoven, 1991; Argyle et al., 1995; Bowling, 1995, Bowling & Windsor, 2001).
The "QOL" or rather the "good quality of human life" can be discussed in various settings: medical, social sciences, philosophy, etc.. Different settings adopt the term QOL for different purposes, each of them using different kinds of assessment **(**Pais-Ribeiro, 2004). The QOL is a much broader concept than e.g. the functional status or health.
The interest in QOL research concerns the description of the function and well-being of populations with and without medical conditions (epidemiological perspective), its use as an outcome criterion for interventions (clinical perspective) as well as its contribution to decision making in social policy and in the health care field (political perspective) (Bullinger, 1997).

According to Musschenga (1997), the term "QOL" was originally used for criticizing policies aiming at unlimited economic growth. The critics pointed at the devastating long-term effects (exhaustion of resources) and side-effects (pollution of the environment) of economic growth on the future conditions of a good life. In using the term "QOL", these

critics expressed a concern for the quality of the external conditions for living (see Ordway, 1953 and Osborn, 1957). For them not only the external quality of the conditions of living was at stake, but also the internal quality of human life or human excellence (Musschenga, 1997).

According to Renwick and Brown (1996) improving the QOL of individuals becomes an increasingly important end-point/criteria in a number of social and behavioural scientific research fields ranging from health care to psychology and including also public planning. Along with this there has been increasing interest in making the concept of the QOL a more explicit construct so that it can encompass a wide range of interests in its definition and investigation.

1.2.1 Global quality of life

The QOL is an example of what can be termed a 'latent construct' - not directly measurable or observable but a hypothetical concept assumed to exist (Fayers et al., 1997). According to Farquhar (1995) the definitions of the QOL can be classified as follows: global definitions, component definitions (research-specific and non-research-specific), focused definitions (explicit or implicit), and combination definitions and lay definitions. In Box 1 some of the different definitions are presented.

Box 1. Some definitions of the QOL

- "QOL means, simply, how good one's life is for an individual" (Renwick and Brown, 1996).
- "QOL is the subjective perception of satisfaction or happiness with life in domains of importance to the individual" (Leidy et al.,1999).
- "QOL is the difference between a person's expectations and actual experience"(Calman ,1984)
- "Individuals' perceptions of their position in life taken in the context of the culture and value systems where they live and in relation to their goals, expectations, standards, and concerns" (WHOQOL Group, 1994)
- "The things people regard as important in their lives" (Bowling, 1995)
- "The possibility for an individual to take control of the outcomes of their life " (Dissart & Deller, 2000)

However, no single definition of the QOL has become a standard. Romney et al. (1994) offer some plausible explanations to this: "(1) psychological processes relevant to experience of QOL can be described and interpreted through many conceptual filters and languages; (2) the concept of QOL is to a considerable degree value laden; (3) the concept of QOL embodies the understanding of human growth and development processes, the average life span of individuals within communities, and the extent to which these psychological processes are influenced by environmental factors and individual value systems." Generally, the only point of agreement among theorists and researchers is that the QOL is a multi-dimensional construct comprising both objective and subjective factors (Cummins, 1996).

It has been suggested (Allison et al., 1997) that the QOL is best interpreted as a dynamic construct, because personal priorities and satisfactions in life vary as a result of changes of both objective and subjective factors. Furthermore, people's personal frames of reference vary among people in response to a combination of their current experiences and the salience of previous experiences.

According to the relative deprivation theory, people value what they have lost or aspire to get (Michalos, 1986).

The framework of a process model of Leventhal and Colman (1997) asserts that the judgments of the GQOL reflect an individual's evaluation of the level of his or her functioning within a number of life domains, as well as the value or importance assigned to these domains. They suggest that the judgment process involves a variety of heureistics or procedures which are affected by contextual factors. Smith et al. (1999) hypothesized that the perceptions of the quality of life are based on a cognitive process which involves: (1) identifying the relevant domain comprising the QOL, (2) determining where one stands on each domain, and (3) integrating the separate domain judgements into an overall QOL assessment. Thus, according to Smith et al.(1999), the QOL is multidimensional in the sense that subjects may simultaneously evaluate several dimensions to arrive to an overall judgement (see also Veenhoven, 1991).

Taylor (1981), however, has pointed out that humans are cognitive misers who prefer simple strategies to more complex ones. When faced with the task of evaluating all the domains of one's life, weighting the evaluations, and integrating the results into an overall judgement, a person is likely to avoid the task and choose a simpler strategy. Thus, a person's emotional state at the time of the measurement may become a major reference point for the overall judgement reported.

In his causal theory Hyland (1992) states that the QOL is a causal sequence in which morbidity causes symptoms, symptoms cause problems, and problems cause affective evaluations. Similarly Fayers et al. (1997) separated the causal indicators, e.g. the health status, from the effect indicators, e.g. the emotional state.

In the present study the concept of the GQOL is defined as an overall evaluation by a person of his or her life. These evaluations are affected by objective (e.g. housing, health, economy etc.) and subjective factors (e.g. appraisals, emotions etc.) in a person's life.

1.2.2 Health-related quality of life

Historically, the concepts of health changed during the second half of the 20th century, as the importance of positive perspectives of health was emphasized in several large studies. From the negative health measures, e.g. cancer-related "five D's" — death, disease, disability, discomfort, and disruption— (Holland and Cullen, 1986), research on health has shifted towards the assessment of more positive dimensions. The new wave of health concepts developed comprehensive and more positive health measures with the purpose of evaluating health, not disease (Pais-Ribeiro, 2004).

The WHO definition of health as a state of complete physical, mental, and social well-being, not merely as the absence of disease, is an example of a positive and comprehensive concept of health (WHO, 1947). According to Smith et al. (1999), the HRQOL originated to distinguish outcomes relevant to health research from earlier research on subjective well-being and life satisfaction in healthy, general population. Some definitions of the HRQOL are presented in Box 2.

The subjective nature of the concept of health is included in the definitions of Revicki et al. (2000) and Cella and Nowinski (2002). These definitions reflect the dimensions of health included in the definition by WHO (WHO, 1947). Recently there has been a trend towards more patient-centered medical care. Laine and Davidoff (1996) define patient-centered care as health care that is closely congruent with and responsive to the wants, needs, and preferences of the patient. This movement is part of the movement of the rights of the patient in the 1960's. It is opposite to the provider-centered model of care. The consequence of that movement is the inclusion of more "soft" outcomes in parallel with the traditional "hard" ones. The QOL is one of the innovative "softer" outcomes. However, besides a concern to humanize health care, there are more practical reasons for the growing interest in the QOL studies. According to Albrecht (1994) interest in the HRQOL has developed as a result of major concerns in health care due to chronic illness as, new technology, cost containment and interest in medical outcomes. The increased prevalence of chronic diseases with the ageing of the society is one important reason for the increasing attention to the QOL in medical research. The outcome in such diseases cannot, by definition, be cure but must relate to the well-being of the patients treated (Editorial, 1997).

Box 2 Some definitions of the HRQOL

"HRQOL, can be defined as "the subjective assessment of the impact of disease and treatment across the physical, psychological, social and somatic domains of functioning and well-being"(Revicki et al. 2000).

"HRQOL refers to the extent to which one's usual or expected physical, emotional, and social well-being are affected by a medical condition or its treatment" (Cella and Nowinski, 2002).

"HRQOL, includes only those aspects of general subjective quality of life affecting a person’s health or health perceptions" (Zack et al. 2004)

Especially in cancer treatment the outcomes of treatment have been under consideration. The outcomes of cancer treatment were traditionally evaluated using biomedical criteria such as disease-free survival, mortality, tumour regression, progression, and relapse rates (King et al., 1997).

Within the last two decades, however, the outcomes of cancer treatments have proved inadequate in demonstrating both the effectiveness of treatment and the patients' experience of it (King et al., 1997). Concurrently, more aggressive chemotherapeutic regimens (with associated toxicities) are being used with the goal of improving the response rates and increasing the survival time (Scott, 1998). The adverse effects associated with these regimens increase treatment-related morbidities and severely impact the QOL of the patients. Due to the complex relationship between the efficacy and toxicity of current cancer therapies, the diagnosis and management of cancer can be a major force in every aspect of the life of the patient (Markman, 1996).

Innovative treatment regimens do not often result in substantial differences in overall survival rather they are, at best, associated with reduced side-effects. This is supposed to reflect a gain in the QOL (Ganz 1994, Holzner, 2001). A similar situation, however, might also exist in patients with a high chance of cure from their neoplastic disease. When the cure rates approach 80 % of cases, such as in the localized stages of Hodgkin's disease, further improvement can be extremely difficult and the therapeutic progress may rather focus on maintaining high cure rates by reducing side-effects and improving the QOL (Fayers & Hand, 1997, Specht et al., 1998). Thus, where the clinician needs to make a choice between available therapies with no great differences in the expected outcome, the process of decision-making is primarily driven by an anticipated gain in the QOL (Casali et al., 1997).

According to de Haes and van Knippenberg (1985), information of cancer QOL studies may (a) help to decide about the relative effectiveness of cancer treatment; (b) enhance the patients' decision-making by providing them with data on the side-effects of the treatment; (c) improve the organization and quality of cancer care; and (d) be used in a prognostic factor analysis. These benefits are likely to concern also the treatment of other diseases.

1.2.3 Distinction of the concepts: global and health-related quality of life

As indicated earlier, the GQOL is not identical with the HRQOL. Although the functional status and well-being are often considered synonymous with the QOL, it is also recognised that the QOL is a broader concept. In his study Flanagan (1982) started in 1972 identified the major factors affecting the QOL using a method entitled "critical incident technique"; 15 domains: material comforts were identified; health and personal safety; relationships with relatives; having and rearing children; close relationships with spouse or sexual partner; close friends; helping and encouraging others; participating in government and local affairs; learning, attending school, improving understanding; understanding yourself and knowing your assets and limitations; work that is interesting, rewarding, worthwhile; expressing yourself in a creative manner; socialising with others; reading, listening to music or watching sports, other entertainment; participation in active recreation. Similarly, Campbell et al. (1976) designed to monitor the QOL of American life with a national sample identifying 12 domains of life: community, education, family life, friendships, health, housing, marriage, nation, neighbourhood, self, standard of living, and work. In both studies, health is only one of the domains of the GQOL, though it emerged as the most important dimension. According to Sen (1992), health is a capability which allows people to live their life the way they want. The QOL can be studied in each of the fields described above, e.g. marriage-related QOL, work-related QOL, and health-related QOL.

Figure 2

Elements of the GQOL

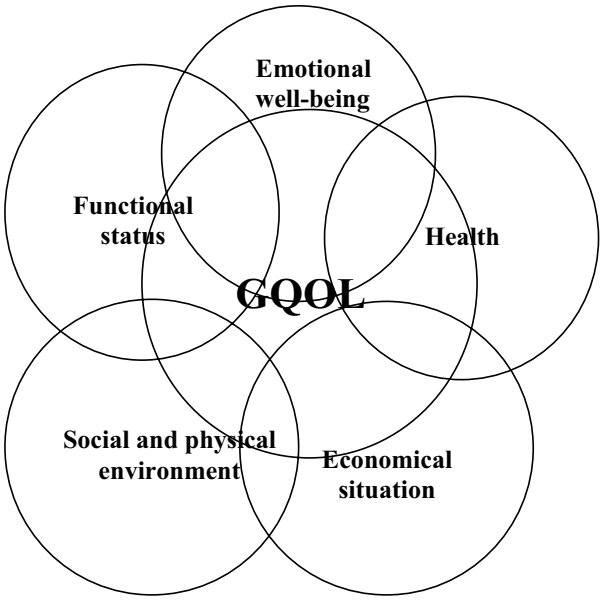


Figure 2 illustrates the major elements of the GQOL. It is to be noticed that these elements are interrelated.

In the present study the global subjective QOL is defined to include all the elements affecting a person's life satisfaction and happiness. The HRQOL, however, includes only the aspects of the global subjective quality of life which affect a person's health or health perceptions or which are affected by a person's health or health perceptions.

1.2.4 Measuring the global quality of life

The multi-dimensional nature of the QOL construct comprising both objective and subjective factors poses a challenge for the measurement of the concept. The subjective factors are generally measured in terms of personal satisfaction with different aspects of life, based on self-appraisals using implicit criteria. In the objective approach, it is assumed that health, physical environment, income, housing, and other observable and quantifiable indicators are valid measures of the QOL and that absolute standards for assessing these variables exist and can be used to determine or define the QOL. The objective approach refers to the degree that a person's life meets explicit standards of the good life, assessed by an impartial outsider. Objective measures of the QOL are needed, because they provide an established anchor point which can be compared across studies and from which deviations of individual perceptions can be evaluated (Spilker, 1990).

Assessing the QOL on the basis of objective indicators alone is, however, problematic. The individual is seen as the best appraiser of his/her own QOL (Carr and Higginson, 2001, Meeberg, 1993; Uutela & Aro,1993). Moreover, the objective measures do not account for subcultural differences in the perceptions of the QOL. Even when a certain group shares the same culture, individuals still have widely varying personal beliefs, values, goals, and needs.

While it seems obvious that there are some aspects of life that are of universal relevance to the QOL, the specific weights that individuals attach to them differ between and within cultures. The interactions between generic and individual aspects also vary between

individuals. Moreover, as stated earlier, these factors and their interrelationships are unlikely to remain static over time (O'Boyle et al., 1992). Values and priorities change in response to life circumstances, such as a life-threatening illness, and experience, such as ageing or adapting to a chronic illness. Viewed in this way, both the determinants and evaluations of the QOL are highly specific to an individual (Carr and Higginson, 2001).

In one of the first large studies in this field entitled, Quality of Life of American People (Cambell et al., 1976), the authors indicated that the relationship between the objective conditions and psychological states is very imperfect and, in order to know the QOL experience of the person, it is necessary to go directly to the individual himself for his description of how his life feels to him**.** Similarly, Veenhoven (1999) points out that the objective and subjective qualities do not necessarily correspond; someone may be in good health by the criteria of his doctor but still feels bad.

Gill and Feinstein (1994) suggested to ask people to give their own global rating for the QOL, as a single global rating can reflect the disparate values and preferences of the individuals and offer investigators a sensible and alternative (or additional) approach to measure the QOL. Thus, a single global rating may capture the core perception of a person's QOL.

According to Schalock et al. (2000), a person's measured level of satisfaction is the most commonly used dependent measure in evaluating his or her perceived GQOL. Some of the reasons from the previous literature found by Schalock et al. (2000) are :

- It is a commonly used aggregate measure of individual life domains (Andrews & Withey, 1976)
- There is an extensive body of research on the level of satisfaction across populations and service delivery recipients (Cummins, 1997; Halpern, 1993; Harner & Heal, 1993; Schalock & Faulkner, 1997).
- It allows to assess the relative importance of the individual quality of life dimensions and thereby to assign value to the respective dimensions (Cummins, 1996; Felce & Perry, 1996, 1997b; Flanagan, 1978, 1982)

Thus, the major advantage of using satisfaction as an indicator of a person's perceived QOL is its usefulness in (a) comparing population samples; (b) providing a common language that can be shared by consumers, providers, policymakers, regulators, and researchers; (c) assessing consumer needs; and (d) evaluating organizational outputs. Its major disadvantages include its limited utility for smaller group comparisons as it provides only a global measure of perceived well-being, as well as its discrepancy with current multidimensional theories of the QOL (Cummins, 1996). Therefore also other dependent measures of the QOL are needed.

Although there is no consensus on which of the potentially infinite number of life domains should be evaluated (Ferrans & Powers, 1985), investigators have generally concentrated on the areas of life with social, personal, and occupational significance (Andrews & Withey, 1976; Campbell, 1981; Cantril, 1965).

The earlier research on life satisfaction by Andrews and Withey (1976), Cantril (1965), Campbell et al. (1976), and Campbell (1981) concentrated mainly on the domains of marriage and family, self, work, social relations, leisure activities, living conditions, and physical health. These domains reflect the issues of everyday life and can be considered to be important elements of the GQOL. Satisfaction with life achievements is considered an essential source of well-being (Campbell 1981). It also reflects how well a person has been able to accomplish his/her capabilities which are regarded as important determinants of the GQOL (Sen, 1992).

1.2.5 Measuring health-related quality of life

It has been noted by Bowling (1991) that, contrary to the small theoretical foundation of HRQOL research, methodological work is relatively advanced.

Four broad dimensions of the HRQOL are generally included in the measures: physical well-being, functional well-being, mental or emotional well-being, and social well-being (Cella, 1992). In a meta-analysis (Cummins,1997) 27 definitions of the HRQOL

attempting to identify HRQOL domains were reviewed. Eighty-five per cent included emotional well-being in some form, 70 % included aspects of health, 70 % social and family connections, 59 % material wealth or well-being, and 56 % work or other forms of productive activity.

In general, two approaches to the HRQOL measurement are available: specific instruments that focus on problems associated with single disease states, patient groups, and areas of function or individuals, and generic instruments that provide a summary of the health-related quality of life (Guyatt et al., 1993).
Most recently developed instruments assume the former approach, that is, they relate to specific disease areas or special populations. For example, there are no longer merely general QOL instruments for cancer, but the instruments have become more specific: there are specific instruments for patients undergoing adjuvant therapy or stem cell transplantation, for long-term cancer survivors, etc. (Sprangers et al.,1999, McQuellon et al.,1997, Brady et al.,1997, Ganz, et al., 1993, Ganz et al.,1992).

Generic instruments offer the opportunity to compare results across patient and population cohorts, and some of these instruments can provide normative or benchmark data for interpreting the results. The generic measures include questions that are usually general enough to be applicable to almost everyone, even those not in a healthy condition. Two of the most widely used generic health status measures are the Medical Outcomes Study 36-Short-Form Health Survey (MOS SF-36) (Ware and Sherbourne , 1992) or its copyright-free version RAND 36-Item Health Survey (RAND-36) (Hays et al., 1993), and the Nottingham Nottingham Health Profile (NHP) (Hunt, 1985). In addition, the GQOL is also included in the MOS SF-36 and the RAND-36. Some generic instruments were not initially designed to be used with healthy populations. However, they can often be adapted for this purpose by deleting the questions concerning a person's specific condition and by prorating scores from the shorter list of questions. Examples of such measures are the European Organization for Research and Treatment of Cancer (EORTC), Quality of Life Questionnaire (QLQ-C30), the Sickness Impact Profile (SIP), and the Functional Assessment of Cancer Therapy-General (FACT-G).

The generic health status measures differentiate groups on larger dimensions of overall health and functioning. In contrast, the disease-specific/targeted measures do the differentiating at finer levels of detail, such as intensity of specific symptoms. Although the generic instruments are likely to be less responsive than the specific measures, they may still provide very useful information beyond that provided by the specific instruments (Wiebe et al., 2003). As the generic instruments are designed to capture all aspects of the HRQL, they provide a broader context where to interpret the information of the changes in the HRQOL.

The generic measures can reveal unexpected disturbances and problems. Rockey and Griep (1980) administered the SIP to hyperthyroid patients and discovered that 57 % of them reported disturbances in their sleep and rest patterns. Sleep problems were not considered a common problem associated with hyperthyroidism, and using a targeted measure this problem may not have been identified.

The disease-specific or targeted measures (Cella and Nowinski, 2002) ask questions focusing more on the specific condition or treatment under study and, as a result, they tend to be more responsive to clinically important changes than do the generic instruments. Each type of assessment has its place in the assessment of the HRQOL, and consideration of the relative advantages and disadvantages of the two options helps the choice of instrument. According to Cella and Nowinski (2002), regardless of how the HRQOL is assessed, the purpose of the HRQOL assessement is nearly always to assess the functional and subjective impact of illness and its treatment on a person. This is highly valuable, because the effects of the same disease process may differ among people.

However, in the HRQOL objective or proxy measures are sometimes needed, e.g. for treatment decisions and economic benefits or when no subjective measure can be used (Uutela and Aro, 1993).

Ormel et al. (1997) have pointed out that perceptions of health, well-being, and life satisfaction are not directly proportional to symptoms and functional limitations, which,

in turn, are not directly proportional to physiological and anatomic abnormalities. The effects flowing from biological abnormalities to the HRQOL are mediated and modified by psychological, social, and cultural factors. One of the key issues in this respect is how a person adapts in his/her situation or with his/her experience.

1.2.6 The disability paradox: adaptation and response shift

Cassileth et al. (1984) found that the groups of physically ill patients (with arthritis, diabetes, cancer, renal disease, or dermatologic disorders) did not differ significantly from one another or from the general public regarding the psychological status. Similarly, the life satisfaction among cancer survivors has been reported as better than that of controls (Irwin et al., 1982). In a study of Bush et al. (1995) SCT patients demonstrated a good mood and low psychological stress in comparison to the population norms. Also Sutherland et al. (1997) reported that long term SCT patients were indistinguishable from the normal population in most domains of the QOL and significantly better in certain psychosocial aspects of health. This phenomenon has been called the disability paradox by Albrecht and Devlieger (1999). As the measures of the HRQL are completed from the perspective of the individual, measurement of this construct is modified by psychological phenomena such as coping and adaptation. Changes in the HRQL may not only be due to changes in the disease or response to treatment, but part of the change may be attributed to what has been referred to as "response shift" (Howard and Dailey.,1979). The working definition of the response shift is "a change in one's evaluation of a target construct as a result of: (a) a change in the respondent's internal standards of measurement (i.e., scale recalibration), (b) a change in the respondent's values (i.e., the importance of component domains constituting the target construct), or (c) a redefinition of the target construct (i.e., conceptualization)" (Sprangers and Schwartz, 1999).

The changes that occur over time as a result of an intervention may influence an individual's internalized standard of judgment of the value reflecting excellent or poor levels of the HRQL. For example, a person who shortly after the transplantation was unable to walk 50 m without assistance and who is now able to walk independently in the community might recall and judge his/her initial level of functioning quite differently

than immediately after the transplantation. The response shift is a natural way in which individuals, who are confronted with a serious illness, adapt and cope with changes in physical health (Postulart & Adang, 2000, Lepore & Eton, 2000) and it influences the measures of change of the HRQL. It is difficult to distinguish the reported change due to the illness or an intervention from the response shift. Conventional comparisons of the mean scores before and after an elapsed period of time do not differentiate between these types of change. One widely used method for assessing the response shift is the thentest (Howard and Dailey, 1979). The thentest is completed at the same time as the post-intervention evaluation and it asks subjects to complete the self-report measure in reference to how they perceive themselves at the time before intervention. As the post-test and thentest are completed at the same time, they are presumed to be completed with the same internal standard. The mean difference between the pretest and thentest scores provides an estimate of the direction and the magnitude of the response-shift effect. However, implicit in this new measurement may be the notion of the re-conceptualization of the HRQOL (Ahmed et al., 2004). If new experiences result in a recalibration of the measurement scale, it is possible that the anchors and intervals will have different meanings (Sprangers and Shwartz, 1999 and Howard, 1979). Visser et al. (2000) have suggested that other methods than the thentest are needed, not only due to its limitations, but also because of the need to assess the response shift that results from changes in the values and conceptualization of the life quality.

Several investigators have turned to the response shift as an explanation of paradoxes found in HRQL research. These include instances when populations with chronic diseases report levels of the HRQL that are equivalent to those of healthy controls (Ahmed et al. 2003**,** Andrykowski et al.,1993 and Breetvelt & Van Dam, 1991), when patients rate their the HRQL better than their providers (Friedland et al., 1996 and Sneeuw et al., 1997), and when discrepancies between objective ratings and self-ratings of health occur (Daltroy et al.,1999).

On the other hand, it is suggested that a biopsychosocial model of adjustment to chronic illnesses, which expands the stress and coping paradigm to incorporate positive aspects of psychosocial functioning and adjustment, such as described by Taylor (1983), may

provide a comprehensive approach to investigate and treat serious diseases. Andrykowski et al. (1993) suggested that a serious illness should not be viewed as a stressor with uniformly negative outcomes, but rather as a transitional event which creates the potential for both positive and negative outcomes.

Studies of psychosocial adjustment in individuals with a history of cancer have largely focused upon the assessment of negative psychosocial sequelae. However, there is a trend to explore more the potential for positive sequelae (Andrykowski et al., 1993), as the ability to manage distress and pain is an aspect of psychological well-being which also incorporates variables, such as optimism, positive daily events, life satisfaction, acceptance of illness, and being physically and socially active. Cella (1992) puts forth a definition of the quality of life that refers to the patient's appraisal and satisfaction concerning the current level of functioning compared to what the patient perceives to be possible or ideal. In this sense, cancer survivors have two options for achieving a high quality of life: by improving their functioning (through enhancement of social structural and/or personal resources) and by changing their expectation of the possible or the ideal.

1.2.7 Health-related quality life among allogeneic stem cell transplantation patients

The QOL following the SCT has been examined in several survey studies. In these studies most of long-term survivors appear to be rehabilitated in terms of their physical health and functioning. The proportion of patients with good to excellent physical well-being varies from 65 to 81 % across the studies (Bush et al., 1995, Schmidt et al., 1993). Several studies have reported good functional well-being among long-term allogeneic SCT survivors with the majority of the recipients returning to work or school (Bush et al., 1995, Schmidt et al., 1993, Sutherland et al., 1997). The psychological status has been found to be closely related to the functional performance and medical problems (Broers et al. 2000, Greenberg et al., 1997).

The results regarding psychological well-being have been more contradictory across the studies. Long-term survivors have been shown to demonstrate a good mood and low

psychological distress compared to cancer and population norms (Sutherland, 1997), more positive and negative affect than do general population samples, as well as less tension, fatigue, confusion, and depression than the comparison groups (Baker, 1991). On the other hand, higher levels of psychological distress have been found among the SCT patients than in the normal population (Andrykowski et al., 1995a): a significant number of SCT recipients were identified with symptoms of anxiety and depression (Mollasiotis, 1996). It is commonly agreed across the studies that a subgroup of long-term survivors continues to experience problems which affect negatively their quality of life.

Fatigue (Bush et al.,1995), lack of energy (Andrykowski et al., 1997), sleep problems (Andrykowski et al., 1997 and Watson et al., 2004), and sexual dissatisfaction (Zittoun et al., 1997 and Watson et al.,1999) have been reported. The physical late effects that have been identified include chronic graft-versus-host disease (GVHD), sterility, cataracts, pulmonary problems, relapse, and development of secondary malignancies (Winer, 1994). Reported social problems are, for example, unemployment (Baker et al., 1991), financial (Watson et al.,2004) and marital problems, job discrimination, and problems in obtaining insurance (Belec, 1992). In one study addressing the question 'returning to normal' the areas where SCT survivors were least likely to report a return to normal functioning included working outside home and engaging in sexual activity or vigorous physical activity (Andrykowski et al., 1995b, Watson et al., 2004).

The HRQOL has, however, been found to improve in the passage of time, especially within the first three years after the SCT. Most SCT survivors have been shown to manage better in the course of time, but the results have not been consistent across the investigations. Bush et al. (1995) studied 125 allogeneic SCT adults surviving from sixto18 years after transplantation. In their sample only 5 % rated their health status as poor but 80 % as good or excellent. The long-term survivors demonstrated a good mood and low psychological distress compared to the cancer and population norms. The incidence rates of physical symptoms, psychological distress and demands of recovery were still, an average relatively high ten years after the transplantation. However, the data

also showed that the intensity or degree of distress attributed to the complications was, for most survivors, consistently low.

Ninety-six per cent of the SCT patients indicated that people were less supportive over time and this demand was the one and most distressing hardship of long-term survival. Over 26 % (23 % of the males and 32 % of the females) revealed that they had physical problems which reduced their satisfaction. Schmidt et al. (1993) found that 40 % of the allogeneic survivors indicated problems with their sexual life, while Wingard et al. (1992) reported that 22 % of the transplant survivors indicated sexual dissatisfaction. Several studies have investigated the QOL after the SCT; in some of them the QOL is examined in mixed groups of autologous and allogeneic SCT recipients despite the fact that patients undergoing these procedures are not comparable (Baker et al., 1991). Studies concentrating on allogeneic patients only or which include a subgroup of allogeneic patients large enough for a separate analysis are fewer in number.

1.3 Stress and coping among cancer patients

The transactional theory of stress (Lazarus and Folkman, 1984) defines stress as a transaction between a person and environment that is appraised by the person as taxing or exceeding his/her resources and endangering his/her well-being. To be stressful the transaction must be viewed as relevant to important personal goals and, as such, potential to dilute a person's QOL. Additionally, the term transaction emphasizes the importance of the contextual relationship between a person and the environment. This implies that stress is a process that changes over time and across diverse encounters.

Meyerowitz et al. (1983) consider cancer, not a single stressor, but a collection of diverse stressful situations and problems. There is a commonality of experience of survival from cancer that is shared by all cancer patients, irrespective of their background or diagnosis. However, some aspects of survivor adaptation are related to the specific illness, its treatment, and the demands the illness has set on the individual (Kornblith et al., 1998). Due to the inherent unpredictability of cancer, cancer patients often experience a

heightened sense of vulnerability and uncertainty about the future. Patients may also be uncertain about the responses of the family and friends. Fear of social rejection and a desire not to burden one's already strained support system may interfere with the receiving of social support following treatment completion (Hjermstad & Kaasa, 1995).

Tschuschke et al. (2001) found three pre-transplant variables with a statistically significant influence in the five-year survival: early-stage of disease (first complete remission in acute leukaemia or first chronic phase in CML patients), low level of distraction at transplantation, and high fighting spirit as a coping response. High helplessness scores have also been linked to a significantly reduced survival probability in a large population–based study among breast cancer patients (Watson et al., 1999).

The above findings emphasize the importance of helping patients to cope with the disease and treatment-related stress. It is argued that the delineation of problems confronting chronic illness populations is the critical first step in the investigation of coping with these illnesses (Turk et al., 1980).

When confronted with traumatic events in life, individuals normally resort to a wide range of coping strategies to alleviate the resultant stress. The conceptual underpinnings of the recent empirical developments in the field of coping with stress and trauma can be traced back to the work of Lazarus and his co-workers (e.g. Lazarus, 1993; Lazarus & Folkman, 1984). These writers viewed the process of coping as composed of two distinct phases: (a) primary appraisal, which refers to a set of cognitions concerning the significance or impact of the stressful event for the individual, and (b) secondary appraisal, which refers to a set of cognitions regarding the availability of resources or options (e.g. coping skills) to deal with the stressful situation.

It has been suggested that the patient's subjective appraisal of the disease and its treatment can affect more the psychological distress than do the external objective characteristics of the illness (Bar-Tal et al., 1998). It is also important to realize which stressful events affect the cancer patients most in order to develop supportive

interventions to enhance the QOL. The identification of these subjectively stressful appraisals empirically has, however, proved to be a challenge in investigating stress and coping, because it involves the need to identify a strategy that captures the complexity of the domains under investigation.

2. Aims of the study

The aim of the present study was to investigate in a cross-sectional design the QOL and factors related to QOL perceptions among allogeneic SCT patients and in the Finnish population. Also the HRQOL and associated factors among the allogeneic SCT patients as well as stress factors related to blood diseases and allogeneic SCT were studied.

The specific research objectives of the study were the following:

1. The determinants of the global QOL among allogeneic SCT patients in groups of patients with a different follow-up time (I)
2. The HRQOL among allogeneic SCT patients and the associations of sociodemographic factors (gender, age, education, work status), disease- and treatment-related factors, and psychosocial factors (I, II)
3. The identification of stressful problems related to haematological diseases and allogeneic SCT (III)
4. The relationships between the global QOL and the QOL dimensions among the Finnish population (IV)
5. The conceptual analysis: comparison between the determinants of the global QOL in the population and among the transplantation patients (additional analyses)

3. Material and methods

3.1 Subjects

The study consisted of two different data sets: one representing all the allogeneic SCT

patients transplanted in 1988-1997 at Helsinki University Central Hospital and the other representing the Finnish population (FINNRISK -97).

3.1.1 Haematopoeitic stem cell transplantation recipients (I, II, III)

One hundred and sixty-two patients who had received an allogeneic stem cell transplantation [(SCT), previously called bone marrow transplantation (BMT)], in 1988-1997 at Helsinki University Central Hospital, Department of Medicine with a minimum follow-up of four months after the allogeneic SCT, aged over 18 years, alive and without a life-threatening relapse at the time of the study, were addressed. A total of 305 patients had been transplanted, 140 of them had died, and three patients were too weak to be approached. All patients were Finnish citizens covered by the national health care system. The subjects were mailed a letter describing the study and a consent form. One hundred and thirty-two patients expressed their willingness to participate in the study, and questionnaires were sent to them accordingly. One hundred and nine patients completed and returned the questionnaires, making a response rate of 67 %. The questionnaires were returned to an independent research centre (National Public Health Institute) not involved in the treatment of the patients. The research protocol was approved by the Ethical Committee of the Department of Medicine at Helsinki University Central Hospital.
The characteristics of the patients studied are presented in Table 1.

Table 1 Characteristics of the SCT patients (n= 109)

Mean (range)	
Age (yrs.)	42 (21-59)
Age (yrs.) at BMT	38 (17-54)
Months post-BMT	55 (4-171)
	n (%)
Sex	
Male	48 (44)
Female	61 (56)
Education	
under 10 yrs.	22 (20.2)
10-12 yrs.	36 (33.0)
over 13 yrs.	53 (46.8)
Married or living with mate	83 (76.1)
Diagnosis	
CML	32 (29.4)
AML	39 (35.8)
ALL	15 (13.8)
MDS	13 (11.9)
MM	5 (4.5)
NHL	2 (1.8)
AA	2 (1.8)
Myelofibrosis	1 (.9)
Existence of cGVHD	
Extensive	17 (16)
Limited	26 (24)
Absent	65 (60)

3.1.2 Population sample (IV)

The FINNRISK-97 health survey was based on a randomly selected sample of 10000 Finnish citizens from five regions, stratified by gender and age, (age groups: 25-34, 35-44, 45-54, 55-64, and 65-74 years). In the present study the oldest age group was excluded. The FR-97 study was conducted in two phases. In the first phase the participants filled up the basic health questionnaire and participated in comprehensive clinical tests for risks of cardiovascular disease (CVD). In this phase the response rate was 71 %. In the second phase the participants filled in a psycho-social questionnaire. The analyses were based on the data consisting of information from both questionnaires

(n= 3838), where the response rate was 64 %. The demographic characteristics of the population sample are presented in Table 2.

Table 2

Sociodemographic characteristics of the population sample (n= 3838)

Age mean (s.d)	45.9	(11.2)
	n	(%)
Gender		
Male	1771	(46.1)
Female	2067	(53.9)
Marital status		
Married/ living with partner	2811	(73.2)
Single, separated, divorced, widowed	1015	(26.4)
Missing	12	(0.3)
Education		
Elementary school up to 9 yrs.	1630	(35.3)
High school, vocational education, commercial college/ general gollege	2431	(53.3)
University	490	(10.6)
Missing	32	(1.7)
Work		
At work/school	2465	(64.2)
motherhood leave	107	(2.8)
Retired	652	(17)
Unemployed	564	(14.7)
Missing	50	(1.3)

3.2 Measures

3.2.1 Global quality of life (I, IV)

The GQOL of the SCT patients was asked by one question:"I am satisfied with the quality of my life right now" (scale: from not at all = 0 to very much = 4).

In the population study global the QOL was measured using the Visual Analogy Scale (VAS). The subjects were asked to indicate on a scale:'How would you estimate your quality of life as a whole during the last four weeks'. The VAS used was a vertical, 15 cm scale, which was calibrated using a measure of length so that 0 represented the worst possible QOL and 100 represented the best possible QOL.

3.2.2 Dimensions of global and health-related quality of life among the patients (I, II)

The measures completed by the SCT recipients included the shortened version of Profile of Mood States [(POMS), McNair et al.,1971 and Shacham,1983], the Functional Assessment of Cancer Therapy BMT-version [(FACT-BMT), Cella et al.,1993 and McQuellon et al.,1997], activities of the daily living scale [(ADL), Katz et al.,1970], MOS Survey of Social Support (Sherbourne CD & Stewart AL, 1991), and A Brief Measure of Social Support [(SSQ6), Sarason et al., 1987]. Crohnbach's alphas computed on the present sample are reported in parenthesis (Crohnbach, 1951).

The shortened version of the POMS is a well-established 37-item adjective check-list, which assesses affects during the preceding week. Higher values on the scale indicate worse emotional well-being. The POMS yields a Total Disturbance score (TMD) and separate subscales for depression-dejection (POMS-DD) (α = .92), tension-anxiety (POMS-TA) (α = .83), confusion (POMS-C) (α = .66), vigour (POMS-V) (α = .75), fatigue (POMS-F) (α = .91), and anger (POMS-A) (α = .74). The scores on the Anger, Fatigue, Depression-Dejection, Tension-Anxiety, Confusion, and Vigour subscales of the POMS were combined to create a total mood disturbance score (POMS-TMD) using a formula: A+F+DD+TA+C+(24-V).

The FACT-BMT is a 46-item treatment- and disease-specific measure of the HRQOL. It produces a subscale for physical (α = .87), functional (α = .82), social (α = .65), and emotional (α = .66) well-being as well as satisfaction with the treatment relationship (α = 70); the BMT (SCT) subscale with 12 items is specifically designed to test the QOL of the SCT recipients (α = .63). The trial outcome Index (TOI, α = .87) combines the Physical Well-Being subscale, the Functional Well-Being subscale, and the BMT subscale. Higher scores on the FACT reflect a better QOL on the reported dimension.
The Activities of daily living scale (ADL, α=.80) is a nine-item scale that measures the need for assistance in daily activities. Higher scores indicate a greater functional ability and less need for assistance.

The MOS Social Support Survey contains 19 functional support items hypothesized to measure the availability of the four dimensions of social support: affectionate support (involving expressions of love and affection) (α = .89), emotional/informational support (offering of advice, understanding, information, guidance or feedback) (α = .92), tangible support (provision of material aid or behaviour assistance) (α = .82), positive social interaction (availability of other persons with whom to do enjoyable things) (α = .87), and the overall support scale (α = .85). It also includes one single-item structural indicator of social support (e.g. number of close friends and relatives). Higher scores on the MOS scales reflect greater support.

A Brief Measure of Social Support (SSQ6) measures perceived satisfaction with social support and availability of support. It has six items measuring both the number of people providing support and the perceived satisfaction with the support (α = .92). In the first analyses scales were used to measure satisfaction with support. Higher scores on the SSQ6 reflect enhanced satisfaction with the level of social support. The descriptive data (age, education, marital status, work situation, number of children, family income, diagnosis) were assessed following the Finnish epidemiological studies (Puska et al., 1995).

In addition to these measures, medical records were used to have information of disease-related factors. Also the Karnofsky Scale (Karnofsky and Burchenal,1949) scores evaluated by a physician was employed as an additional measure. The Karnofsky Scale is a global indicator for self-sufficiency and functional capacity. It is a ten-point scale ranging from 10 % to 100 % of functional capacity, with 100 % indicating the best functional status.

3.2.3 Dimensions of the global quality of life in the population sample (IV)

Emotional well-being was measured using the Beck Depression Inventory [(BDI) Beck et al.,1961] (α=.87) and the short form of the State Anxiety Inventory [(STAI) Marteau &. Bekker, 1992] (α=.85). The BDI is a 21-item scale that assesses the presence and severity

of affective, cognitive, motivational, vegetative, and psychomotor components of depression. The Finnish 22-item version included a question of weight gain (Raitasalo, 1977), but this item as well as the item concerning weight loss were excluded. In this study the sum of 20 BDI items was calculated. The short STAI measures the state of anxiety with six items. Functional well-being was measured using the Activities of Daily Living Scale (ADL) (α=.72).

Physical well-being was measured in two ways. The subjects were asked to indicate their physical well-being by answering the question: " How would you estimate your current health status" on a scale from very good (1) to very poor (5). Based on a list the patients were also asked to report the absence or presence of the diagnosed disease during the previous year. Social well-being was assessed with two measures: firstly, perceived availability of social support was measured with a Brief measure of social support [(SSQ6) Sarason et al., 1987] (α= .94) and, secondly, the participants were asked to indicate their satisfaction with the family life on a scale from very unsatisfying (1) to very satisfying (5).

Additionally, the participants were asked to indicate how satisfied they were with their life achievements and economic situation on a scales from very unsatisfying (1) to very satisfying (5). The sociodemographic information included age, marital status, education (years of education), current household income, and work status (working, unemployed, retired).

Table 3

Operationalization of the concepts of the GQOL and the measures of the QOL dimensions in the population sample and among the SCT-patients

Population sample, Finrisk study- 97	**SCT-patients**
Global QOL	
'How would you estimate your quality of life as a whole during the last four weeks?' (scale: 0=worst possible, 100=best possible)	'Right now I am satisfied with my current quality of life'(from not at all = 0 to very much= 4)
Physical well-being	
1. perceived health: "What is your current health?" ("very good=1 to very poor= 5") and 2. self reported number of diagnosed diseases	FACT's subscale of physical well-being (the scale included questions like): "I feel fatigued"; "I am bothered by side-effects";"I have pain"; "I feel myself ill"
Functional well-being	
1. Activities of Daily Living Scale (ADL) and 2. perceived physical condition "What is your current functional condition"? ("very good=1 to very poor= 5")	Activities of Daily Living Scale (ADL)
Social well-being	
1. Availability of social support (SSQ6) and 2. "How satisfied you are with your family life"? (very good=1 to very poor=5)	Availability of social support (MOS-SS)
Emotional well-being	
Beck Depression Inventory (BDI) State Anxiety Inventory (STAI)	Anxiety and depression scales of the shortened version of the Profile of mood states (POMS)

3.2.4 Identification of problems and stressful issues related to haematological diseases and transplantation (III)

Data collection

A free–response methodology was used to identify the disease and the SCT-related stressors. The specific methodology (concept mapping) used in this study was based on a series of concrete operationally defined steps described in detail by Trochim (1989b) and Trochim and Linton (1986).

Step 1: Defining the conceptual domain

Twelve pre- and post-transplantation patients were invited to participate in focus groups (n=8) and interviews (n=4). To ensure representativeness the patients were selected according to gender, age, diagnoses, and post-SCT time.

Two focus-group sessions and four interviews were conducted. The specific focus statement was: "Generate statements which describe specific stress factors you have encountered after your diagnoses and your bone marrow transplantation as a SCT recipient". The participants were asked to generate as many statements as possible, criticism was discouraged, and participation encouraged. The participants generated 132 stress-related statements. After similar statements were taken away, 98 different statements were printed on small cards, one statement on each card.

Step 2: Structuring the statements

The second phase of the study involved all 109 SCT recipients who had indicated their willingness by signing the consent form. This phase was accomplished by mail.

The participants were asked to separate the cards into piles "of similar items in any way that makes sense to you". The only restrictions were: (1) an item cannot be placed simultaneously in two separate piles; (2) all items cannot be placed in a single pile; (3) all items cannot be placed in their own piles; and (4) items that do not appear to be related to any other should be in there own pile rather than in a miscellaneous pile. The major advantages of the sorting procedure were that it was easily understood by the participants and it took little time to accomplish. When the sorting task was completed,

the subjects were asked to rate the 98 stress items on three appraisal dimensions: frequency of occurrence (1= rarely and 5= very frequently); intensity of the associated distress (1= minor stress; 5= unbearable distress); perceived controllability (0= no control; 5= completely controllable).

3.4 Missing data (I, II, III, IV)

In the composite scales the average value of non-missing items was computed for respondents having non-missing responses in at least 75 % of the scale items. This method has been shown to provide the accurate estimates (Fairclough & Cella, 1996).

Respondents vs. non-respondents among the patients (I, II, III)

The non-respondents had on an average a significantly longer follow-up time after the SCT, 77 vs. 57 months ($p < .001$) and they were younger at the SCT, 34 vs. 38 years ($p < .05$), compared to the respondents. The non-respondents scored on an average slightly higher on the Karnofsky performance scale (mean = 96 %) compared to the respondents (mean = 94 %), but the difference between the two groups was not statistically significant. The groups did not differ regarding the diagnosis.

Missing data on the VAS (IV)

The number of missing data (n=110, 2.9 %) on the VAS was higher than e.g. that in the item of health status (n=14, 0.3 %). Males and females were as likely not to respond on the VAS (number of males 58 and of females 52, respectively, $\chi^2 = 1.9$ $p= .16$). On an average the non-respondents were older, they perceived their physical and functional status worse, and indicated more depressive symptoms and anxiety than the respondents (Table 2, III). However, the VAS scale was located on the last page of the 15-page questionnaire with 202 items. The number of missing data on the question (‘How willing are you to give up your hobby’) next before the VAS was 97 (2.5 %).

3.5 Statistical analyses

Research objective no. 1

"The determinants of the GQOL among allogeneic SCT patients at various points of the follow-up time (I)"

To explore the relationship between the time post transplantation and the global QOL, the patients were stratified into groups according to the length of time after their SCT: 4-12 months (group=1), n = 18; from 13 months to three years (group=2), n = 29; more than three-five years (group= 3), n = 25; and more than five years after the SCT (group= 4, n = 37. The multiple regression analysis was conducted in order to evaluate variables which significantly contributed to the satisfaction with the QOL. In the study I, a set of five predictor variables was employed including gender, age at SCT, satisfaction with social support, education, and physical well-being. The set of five predictor variables was force-entered into a regression model at a single step. The analyses also included effect-size statistics that described the magnitude of the observed relationship. The effect size, expressed here as a proportion of variance (PV) statistically explained, provides an assessment of the importance of the observed result. A higher effect size suggests an important difference. For the tests of the group differences, PVs <5 % are generally considered small; PVs between 5 and 10 % moderate; and PVs >10 % large and likely to be of clinical importance (Bush et al., 1995).

The statistical analyses were conducted using Statistical Package for the Social Sciences (SPSS® Base 9.0). The results were considered statistically significant if the probability of their occurrence was 0.05 or less.

Research objective no. 2

"The HRQOL among allogeneic SCT patients and the associations between the sociodemographic factors (gender, age, education, work status), disease and treatmen- related factors, and psychosocial factors (I, II)"

The one-way analysis of variance was used to test the differences between the male and female recipients in the mean QOL ratings. The univariate analyses of covariance (ANCOVA) were used to detect the main effects of gender on the QOL domains with the effects of the follow-up time, age at SCT, marital status, cGVHD, total body irradiation (TBI) received in the pre-SCT conditioning, perceived physical well-being, and education, each taken as covariate. Pearson's correlation co-efficients were calculated to examine associations between the QOL dimensions and the follow-up time, current age, age at SCT, education, marital status, availability of social support, and satisfaction with social support.

Furthermore, clinical experiences have shown changes in emotional well-being and social relationships of the patients after the first post-SCT year (Kopp et al.,1998). To detect these possible changes a group of patients transplanted within one year was compared to the patients with a follow-up time of more than one year**.**

The χ^2-tests were conducted to analyse gender differences in the categorical variables.
To discover any gender differences in the passage of time, the patients were stratified into two groups according to the length of time after their SCT: I group $\leq$ 36 months, n = 48; II group > 36 months, n = 61. The probability level required for statistical significance was set at 0.05.

Research objective no. 3

"Identification of stressful problems related to a haematological disease and allogeneic SCT (III)"

On the basis of the sorting of the items, multidimensional scaling (MDS) and hierarchical cluster analyses were used to analyse and graphically present the underlying structure of the stress responses of the SCT patients. These analyses were performed by using The Concept System (Trochim et al., 1994, Trochim, 1995), a software package designed specifically for this methodology. In the multidimensional scaling each statement was placed on a map called a point map (Trochim, 1989, see also Florio et al., 1998).

According to the system, statements closer together were more likely to be sorted into the same piles more frequently, whereas statements that were apart were more likely to be sorted into different piles more frequently. The cluster analysis utilized the multidimensional scaling X-Y co-ordinate values for each point and grouped statements on the map into clusters which were intended to represent underlying dimensions. Trochim (1989) has reported that the range of cluster solution should be examined in a reverse order. At each reverse step, two clusters emerge. The clusters that emerge at each step are examined, and a subjective determination is made whether the two merged clusters obscure an important distinction preserved by retaining the separate clusters. When the entire range of solutions is examined in this manner, a judgment can be made about the cluster solution that yields the fewest number of clusters but still preserves the maximum amount of substantive details.

A goodness-of-fit measure known as bridging value is used to analyse the range of cluster solutions quantitatively. A bridging value can be computed for each item, and an average bridging value can be computed for each cluster. The bridging value for an individual item indicates whether the item was sorted more frequently with other items which are close to it on the map. The cluster-average bridging value is the mean of the individual item values and indicates how clearly a cluster reflects the content in its specific portion of the map. Bridging values range from zero to one, and decisions about the final cluster solution aim at minimizing the cluster–average bridging values while still providing sufficient substantive details.

The mean appraisal ratings for stress items were also calculated. For the final stress clusters, means and standard deviations were calculated for each appraisal dimension, and analyses of the internal consistency and unidimensionality (Cronhbach alpha) of the appraisal ratings were conducted.

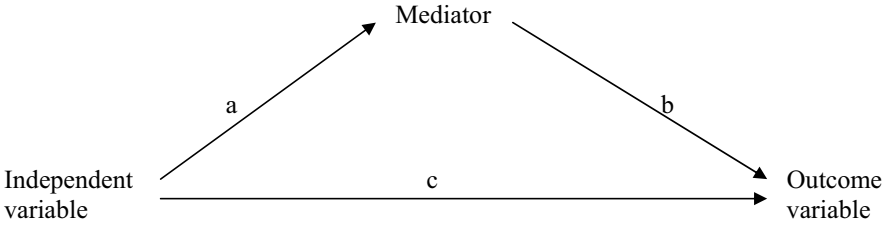
Regarding the criticism related to retrospective studies and the difficulties of the participants to recall stressful things correlation coefficients were calculated between the follow-up time and all the stress clusters.

Research objective no. 4

" The relationship between the GQOL and its determinants among the Finnish population (IV)"

The relationships between the GQOL and perceived health, number of diagnosed diseases, perceived functional status, ADL, BDI, STAI, SSQ6, satisfaction with family life, satisfaction with life achievements, and satisfaction with economical situation were analysed with the Pearson's product moment correlation coefficients. The effects of the domains of the QOL on the VAS were analysed using the hierarchical regression analysis. For each QOL dimension two variables were entered into the same block to assess more comprehensively the aspects of the dimension (see Schafer 1991). The order of the variable entrance into the models was based on Hyland's (1992) causal theory of the GQOL and suggestions of Fayers et al. (1997) regarding the separation of the causal indicators from the effect indicators. For example, the health state may be considered a causal indicator and the emotional state an effect indicator. An effect indicator may act as a mediator variable between the causal indicator and the outcome.

Figure 3. Mediational model



(Baron and Kenny, 1986)

Figure 3 illustrates a mediational model. According to Baron and Kenny (1986), a variable functions as a mediator when it meets the following conditions: (a) variations on the levels of the independent variable significantly account for variations in the presumed mediator (i.e. path a), (b) variations in the mediator significantly account for variations in the dependent variable (i.e., path b), and (c) when paths a and b are controlled, a previously significant relation between the independent and outcome variable (path c) is no longer significant or it decreases significantly. The last condition applies to the

behavioural sciences. Most areas of psychology as well as social psychology treat phenomena that have multiple causes (Baron and Kenny, 1986).

The effect-size statistics is expressed as square of regression coefficients (r^2). The variables which were thought to play an earlier role were first entered into the models. Accordingly, in the first block social demographic variables (work status, marital status, income level, education, and age) were entered, in the second block measures of physical well-being, in the third block measures of functional well-being, and measures of social well-being were entered in the fourth block. Due to their nature as effect variables, satisfaction with life achievements was entered in the fifth block and measures of emotional well-being in the sixth block. As problems were expected to arise with the collinearity of the variables, the collinearity statistics were included in the models. For each variable the tolerance ($=1 - R^2_i$) was calculated. R^2_i is the squared multiple correlation of that variable with the other independent variables and it tells the percentage of the variability explained by the other independent variables. The values of tolerance range from zero to one. When the value is low (close to zero), the variable is almost a linear combination of the other independent variables (SPSS® Base 9.0 p.221). The analyses were conducted separately for males and females. There is reasonable evidence that the components of the GQOL or life satisfaction have different impact among males and females (Li et al., 1998) and that there exist differences in the symptom prevalence between the two genders (Aromaa et al. 1989).

The following analyses were carried out: (1) the chi-square tests to compare categorical variables; (2) the oneway analysis of variance to compare continuous variables; (3) Pearson correlation coefficients between the GQOL and continuous variables, and (4) the hierarchical regression analysis to investigate the impact of the named variables on the VAS. Due to the comparatively large sample, p-values under the level of $p< 0.01$ were considered statistically significant.

Research objective no. 5

Determinants of the GQOL in the patient population over time (additional analyses)

To allow comparison of the results of the population study, additional empirical analyses were done among the SCT patients. In order to lessen the risk of type II error by increasing statistical power the patient population was stratified according to the follow-up time into two groups (I-group = ≤ 36 months, n= 48, II-group= over 36 months, n= 61). Additional analyses were conducted using hierarchical analyses of regression. The variables into these new analyses were selected on the basis of conceptual similarity with the variables used in the population study (IV). The variables are presented in Table 3 (p. 38). These new models included the following variables:

1. Sociodemographics; age, gender, education, income level, marital status;
2. Physical well-being; FACT's physical well-being scale;
3. Functional well-being; activities of daily living scale (ADL);
4. Social well-being; availability of social support (MOS-SS)
5. Emotional well-being; anxiety and depression scales of the POMS.

4. Results

4.1 Global quality of life in the passage of time among the patients (I)

The perceived satisfaction with the QOL did not, on an average, differ statistically significantly between the groups (I). However, only 50 % of the recipients with a follow-up time of one year or less indicated “quite a bit”, or “very much” satisfaction with their QOL, as compared to 81.1 % of the patients with a follow-up time of more than five years. The multiple regression analysis was used to examine the association between the demographic variables and satisfaction with the current global QOL in the groups. Five predictor variables, found to be important in earlier studies, were used in the analyses: gender, age at SCT, education, physical well-being, and satisfaction with social support (Table 4).

Table 4
Beta weights for multiple regression analysis of satisfaction with the QOL after SCT

	Time after BMT (months)			
	≤12 n= 18	13-36 n= 29	37- 60 n= 25	>60 n= 37
Predictor variable				
Gender[a]	.19	.26	-.03	.03
Age at SCT	.09	.33*	-.13	.14
No. of years of education	.12	-.13	-.17	.59***
Physical well-being (FACT)	.93***	.72***	.59*	.04
Satisfaction with social support (SSQ6)	-.28	.04	.18	.47***
Multiple R	.89	.76	.62	.72
Variance accounted for	79.4 %	58.4%	38.0%	51.0 %
F-value	9.26 ***	5.90**	2.25[ns.]	6.56***
Degrees of freedom (d.f.)	5, 12	5, 21	5, 18	6, 31

p***< 0.001; p**< 0.01; p*< 0.05. [a] Coded as male=1, female= 2;

Physical well-being proved to be a significant (p<.001) predictor of satisfaction with the QOL until three years from SCT. Among the respondents with a follow-up of one to three years also the age at SCT proved to be a significant predictor (p<.05), indicating that the patients transplanted at an older age perceived more satisfaction with their QOL than those transplanted at a younger age. To analyse closer the impact of age, patients under 40 years of age were compared to those of 40 years or more with the multivariate analysis using perceived physical well-being as a covariant in the follow-up groups. Only in the group of one to three years post-SCT, the patients under 40 years of age were found to be less satisfied with their current QOL (mean 2.3, s.d.1.6, n=8) as compared to the patients older than 40 years of age (mean 3.3, s.d.= .8, n= 20) when physical well-being was accounted for (F= 7.2, p< .05, eta^2= .23).

The proportions of variance in these two models accounted for were 79.4 and 58.4 %. After five years post-SCT satisfaction with social support and education proved to be significant predictors of the life satisfaction. The accounted variance for the model was 51 %. Patients with good perceived social support and good education experienced more satisfaction with their QOL.

4.2. Health-related quality of life among the patients

4.2.1 Physical and functional well-being

The mean scores for the Karnofsky performance scale, the FACT physical, the FACT functional, the BMT (SCT), and the TOI scales after SCT are presented in Table 5.

Table 5 The means (standard deviations) of physical and functional well-being after SCT (n= 109)

Well-being Dimension	Time after BMT (months) 1= ≤12 n= 18		2= 13-36 n= 29		3= 37-60 n= 25		4= >60 n= 37		P-value	R^2	pairwise contrasts
Physical well-being	18.5	(6.5)	23.3	(4.9)	23.2	(4.5)	25.4	(3.3)	.00	.20	1 vs 2,3,4
Functional well-being	17.6	(5.2)	19.4	(3.2)	19.4	(3.7)	20.1	(3.1)	.15	.05	
Karnofsky scale	91.1	(12.3)	93.7	(9.2)	97.1	(4.6)	94.3	(17.1)	.48	.02	
BMT(SCT)-subscale	33.9	(7.1)	37.9	(4.6)	36.8	(5.7)	37.4	(5.4)	.10	.05	
Trial outcome index	72.7	(18.5)	83.8	(11.6)	82.3	(12.4)	86.2	(10.5)	.01	.15	1 vs 2, 1 vs 4

The group differences were analysed using the analysis of variance. On an average, during the first year from the SCT the patients perceived their physical well-being as worse than did those in the other follow-up groups ($p<.0001$ and PV= 20 %). The TOI also revealed that the overall well-being during the first year after the SCT was significantly worse than that of the patients from one to three years and more than five years after the SCT. This model explained 15 % of the variance. The mean scores of all the measures of physical and functional well-being improved with time.

Some individual items of the FACT relevant to the physical and functional well-being of the SCT patients, i.e. lack of energy, side-effects, and sleeping, were analysed separately (Appendix 2, Table 1). All these items showed significant improvement one year after the SCT. Five years after the SCT only two (5.4 %) out of 37 patients indicated much/very much lack of energy, sleeping problems, and side-effects. Measured with the ADL scale most of the respondents could carry on with their daily activities without any help after the first year since the SCT: 92 % of the patients could walk outside, 96 % could walk inside, 93 % could do light work, 99 % could walk stairs, 93 % could do their shopping, and 72 % of the patients were able to do heavy household work.

After one year 61 (67.8 %) patients were actively participating in work, school or household activities, 23 (23.3 %) were on pension, seven (7.8 %) were unemployed, and one (1.1%) on sick leave. The manual workers (n=34) were less likely to get back to

the office workers and 47 % of the manual workers were currently working or studying.

There were no statistically significant differences between the manual and office workers in physical well-being (FACT-P) nor in the Karnofsky performance scales. Seventy-three per cent of the manual workers answered yes to the question "Do you think that you would have benefited of vocational rehabilitation" as compared to 37 % of the office workers. The subjects (n=42) who believed that vocational rehabilitation would have been beneficial had a significantly (F= 8.64 p=.004) lower educational level compared to those (n=48) who did not believe in benefits of rehabilitation.

4.2.2 Emotional and social well-being

The psychological well-being of the SCT recipients was analysed using the FACT emotional well-being scale, the POMS depression (POMS-DD) and anxiety scales (POMS-TA), and the total score of the POMS (POMS-TMD). Two statistically significant differences between the post-SCT groups were discovered. The mean scores of the POMS-TA and POMS-TMD scales showed that the patients who were within the first year after the SCT experienced more anxiety and a total mood disturbance compared to those with a longer follow-up time. The mean scores of the FACT emotional well-being scale and POMS-DD showed a consistent trend towards improved emotional well-being after the first year since the SCT. The mean scores on the scales of social well-being, satisfaction with social support, and availability of support did not reveal any statistically significant differences between the groups (Table 6).

Table 6 Emotional and social well-being during and after the first year after SCT (n= 109)

	Time after SCT (months)		
	n=18	n= 91	
	≤12	over 12	
Measure	mean (s.d)	mean (s.d)	F-value
Emotional well-being (FACT)	15.7 (2.3)	16.5 (2.9)	1.0
Depression (POMS-DD)	7.2 (7.1)	4.9 (4.7)	2.8
Tension-anxiety (POMS-TA)	9.8 (5.0)	7.6 (4.2)	4.1*
Total mood (POMS-TMD)	49.1(25.0)	38.0 (18.5)	4.8*
Social well-being (FACT)	22.5 (2.5)	21.6 (4.3)	0.7
Measure of social support (MOS)	81.9 (8.2)	78.2 (12.6)	1.5
A Brief Measure of Social Support (SSQ6)	32.6 (2.1)	32.2 (4.0)	2.0

On an average, the availability of social support (MOS) as well as satisfaction with social support (SSQ6) declined after the first year after the SCT.

4.2.3 Gender- and health-related quality of life after the transplantation

The mean values of the male and female patients on the QOL dimensions are presented in Appendix 2, Table 3. On the FACT's emotional well-being and the SCT scales the female recipients indicated, on an average, worse well-being compared to the males. However, regarding the FACT physical, functional, and social well-being scale there were no statistically significant differences between the follow-up groups. Neither were there any statistically significant differences between the gender groups on the ADL-or Karnofsky performance scale. The gender groups did not differ regarding the following POMS scales: depression, anxiety, confusion, anger or total mood disturbance. However, there was a statistically significant difference on the fatigue scale. The fatigue scale includes items concerning a person's feelings of being active, energetic, and having feelings of being washed out and worn out.

In the multivariate analysis it was seen that when the follow-up time, age at SCT, education, perceived physical well-being, and cGVHD were taken into account, the above-mentioned main effects of the gender remained (the main effect of gender in emotional well-being $F= 4.5$, $p<.05$, $R^2= .06$ and in fatigue $F= 4.6$, $p<.05$, $R^2 =.04$) .

The female and male respondents did not differ in any of the MOS subscales or on the MOS overall support scale. The male respondents were less satisfied with the received social support measured with the SSQ6. When the marital status was considered by the multivariate analysis, the difference between the genders remained (main effect of gender $F= 4.4$, $p<.05$, $R^2 =.04$). Regardless of the marital status, the males were, on an average less, satisfied with their social support.

To analyse closer the specific domains on the FACT scales where the females and males mainly differed, an item-by-item multivariate analysis was performed with perceived physical well-being, follow-up time, age at SCT, education, and cGVHD as covariates. The male SCT patients perceived themselves, on an average, less sad and indicated less tiredness than the females. On an average, the female recipients reported the side-effects of the treatment worse than they had anticipated and showed less interest in sexual life being not as satisfied with it as the male patients.

The comparisons of the quality of sleep and tiredness were based on single FACT items: "I am sleeping well" (FACT 31) and "I get tired easily" (FACT 42).
In the group of three years or less after the SCT the number of male recipients indicating very much/much tiredness (30.4 %) was higher than that of the female recipients (22.7 %). However, in the groups over three years since the SCT the percentage of males indicating very much/much tiredness had decreased to 4.3 % but, on the contrary, the percentage of females had increased to 34.2 %. Among the males the number of recipients indicating very much/ much tiredness decreased in the passage of time. After three years since the SCT 87 % of the males and 48 % of the females indicated not at all/a little bit tiredness.

The same phenomenon can be seen when assessing the quality of sleep. According to the follow up time, in the first group (< three years post-SCT) 79.2 % of the males indicated much/very much good quality of sleep and in the second group (>three years post-SCT) 96 %, respectively. Among the female patients there were no differences between the follow-up groups (68.2 vs. 68.3).

The categorical results of the FACT items: “How satisfied you are with your sexual life” and “Have you been sexually active during the past year” are presented in Table 5 (II). Only two (6 %) out of 32 married male recipients indicated not at all/a little bit sexual satisfaction compared to 14 (28.0 %) out of 50 married females. Twenty-two (69 %) out of 32 married males indicated much/very much sexual satisfaction compared to 21 (42 %) out of 50 married females (χ^2=7.5, df.=2, p<.05). Seven (58 %) out of 12 unmarried males indicated not at all/ a little bit satisfaction compared to five (56 %) out of nine unmarried females. Unmarried females were found to be least sexually active; only one out of ten females indicated sexual activity. Married males were most active in their sexual life; 81 % of them had been sexually active compared to 58 % of the females (χ^2 = 4.95, p= .026).

4.2.4 Health-related quality of life and its determinants among the patients

The correlation coefficients of post-SCT time, current age, age at SCT, education, marital status, satisfaction with social support, and availability of social support with the FACT scales and POMS TMD scale are presented in Table 4, Appendix 2. The perceived physical well-being was related to the post-SCT time, indicating better physical well-being over time. Among the males emotional well-being, quality of sleep, and tiredness proved to be associated with the post-SCT time as well. Among the males being older and married indicated better social well-being. Among the females older age at SCT was an indicator of worse physical and functional well-being, and further existence of cGHVD was associated with poorer emotional well-being. Among the females poorer education was an indicator of experienced tiredness. Among the male patients there were no statistically significant relationships between education and any of the measured dimensions of well-being. Among the female patients marital status was not associated with social support. Among both genders satisfaction with social support associated with the total disturbance scale. Age at SCT was associated both among the the married (living with mate) male and female recipients with sexual satisfaction, older age at SCT indicating worse sexual well-being. Among the males the longer follow-up

time and absense of cGVHD indicated better sexual satisfaction. Among the females older current age indicated worse sexual well-being.

Three largest diagnosis groups were compared on the FACT well-being scales using the oneway analysis of variance. There were no differences between the CML-, AML-, or ALL- patients with regard to physical, social , functional or emotional well-being.

4.3 Stress related to haematological diseases and transplantation

"Identification of stressful problems related to haematological diseases and allogeneic SCT "

Appendix 1 shows the means and standard deviations for frequency, intensity, and controllability appraisals of the stress items. Overall, the ten most frequently and intensively experienced and most uncontrollable stressors were: 33. “It was a shock to become ill”, 41. “Long-lasting treatment”, 3. “Fear of the future graws the family”, 37. “It was difficult for the family to bear the diagnosis”, 36. “Fear of future”, 74. “It was difficult to realise how weak one’s physical condition became”, 6. “Vomiting during treatment”, 10. “Excitement of the blood counts”, 9. “Lack of appetite”, and 57. "Thoughts were wandering around the disease not controlled by the will"

A map of the stress statements

A rating map of the perceived intensity of the stress statements is shown in Appendix1, Figure 1. The items close together show a high degree of similarity in their meaning and form the clusters. The column height indicates the intensity of the perceived stress. For instance, statements reflecting the negative aspects of social life on the right 61. "It was difficult for my friends to approach me", 38. "The friends started to avoid me", and 90. "Silence within the family was terrible" form a cluster of negative social support. Additionally, on the left side of the map statements 97. "Diarrhea", 9. "Lack of appetite", and 6. "Throwing up during the treatment" describe the side-effects of the treatment. Furthermore, the right-side statements 21. "Fear of death", 87. "Fear to go to the clinics",and 72. "Feelings of loneliness" reflecting emotional distress, are mapped

together, as are the statements on the left side, 13. “Absence of the family”,and 37. “It was difficult for the family to bear the diagnosis" which reflect the burden of the family.

The stress cluster map

The cluster solutions from four to 20 clusters were examined. After the different cluster solutions had been analysed the process was ended up with a solution of eight clusters. The eight-cluster solution was chosen as it had the lowest average bridging values and still retained the units interpretable (Appendix 1, Fig.1). The clusters (Table 7) also showed unidimensionality measured with Crohnbach's alphas. The alphas varied from .71 to .88 (Table 7) indicating acceptable internal consistency.

Table 7 Clusters with bridging values and Crohnbach's alphas

	Average bridging values	Intensity	Frequency	Controllability (not able to control)
Change of life and long-lasting treatment	.51	.77	.78	.79
Side-effects	.44	.77	.75	.80
Family-related stress	.63	.79	.79	.79
Distress related to treatment outcome and physiological status	.21	.87	.86	.88
Other concerns	.17	.78	.75	.80
Stress related to the medical staff	.09	.85	.83	.88
Fear of death and depressive thoughts	.20	.82	.81	.79
Negative social support	.22	.79	.71	.85

The means and standard deviations for the stress clusters are presented in Appendix 1.The clusters were labelled according to the item content and literature. The mean intensity of appraised stress is also presented in Appendix 1, Figure 1. The number of layers indicates the average intensity of the stress domain. The items causing the most intensive stress emerged in the clusters “Change of life “ and “Side-effects”, followed by “Family-related stress” and “Distress related to treatment outcome and physiological status”. “Lack of information and stress related to the medical staff” was perceived as the least intensive stress cluster.

The means and standard deviations for frequency, intensity, and controllability appraisals of the stress clusters are also presented in Appendix 1. When the frequency, intensity, and controllability appraisals were summed up “Change of life and long-lasting treatment” proved to be the cluster producing the most intensive stress. Other highly stressful clusters were “Side-effects”, “Distress related to treatment outcome and physiological status”, and “Family-related stress”. On an average, “Lack of information and stress related to the medical staff”, was perceived as the least intensive cluster. Also the stress related to "Negative social support" was perceived as less severe. On the cluster map two distinct sections appeared, one (located in the upper part of the map) describing problems related to the social environment (family, hospital personnel, and friends) and the other (in the lower part of the map) describing the patient's perception of illness, emotional states, and treatment-related factors.

Relationship between the follow-up time and the clusters

To estimate the impact of the follow-up on the perceptions of stress, the relationship between the follow-up time and the intensity, controllability, and frequency of the recalled stress clusters was assessed using the correlation coefficients. The perceived intensity of “change of life” correlated significantly ($r = .22$, $p < .005$) with the follow-up time indicating that the recipients with a longer follow-up time perceived more intense stress regarding “change of life”. The follow-up time was not related to any other stress cluster.

4.4. Global quality of life and associated factors in the Finnish population

Relationship between the GQOL and QOL dimensions

Both among males and females strong negative correlation coefficients were found between the GQOL and the state anxiety and depressive symptoms (Appendix 2, Table 5). Also the perceived health correlated significantly with the VAS in both gender groups. The relationship between the functional status and the VAS scores was statistically significant among both genders as were also the correlation coefficients between the VAS scores and the BDI and STAI scores. The relationship between social support measured with the SSQ6 and VAS scores was low, among the males $r = .09$ and among the females

r=.03. However, satisfaction with family life correlated over .30 among both genders. Satisfaction with life achievements as well as satisfaction with economical situation were more strongly related to the GQOL among the males than among the females, though significant correlation coefficients were also found among the females.

Factors of the VAS scores

To investigate the impact of different factors on the GQOL among the Finnish population hierarchical analyses of regression were carried out. The betas are presented step by step. The F-statistics as well as the collinearity statistics of the models are presented after the sixth step, when all the factors were entered into the models (Appendix 2, Tables 6-7). Both of the models were statistically significant, and the variances explained (R^2) varied from 48 % among males to 45 % among females. On each stage of the analysis there was a statistically significant change in the variance explained. Among both sexes higher age predicted a better GQOL. Among the females the income level and work status, though not exceeding the level of statistical significance, proved to be statistically indicative ($p< .05$) predictors of the GQOL. The percentages explained by the demographic variables were small among the males, 5 %, and among the females, 2 %. There were significant changes (among the males; $\Delta R^2 = 10$ % and among the females; $\Delta R^2 = 9$ %) in the variances explained after the variables measuring physical well-being had been entered into the models. After the third block, which included measures of the functional well-being, the variance explained grew only one per cent among the males and two per cent among the females. This result was assumed to be due to the collinearity of physical and functional well-being. It was presumed that when the measures of physical well-being were entered first into the model, part of the common variability of the measures of functional and physical well-being was taken into the second block. This phenomena was tested with the models of changed entrance of the measures of functional and physical well-being. The ADL scale also proved to be a non-significant predictor in the test models. However, perceived functional well-being turned out to be a more significant predictor in the test models than it was in the final model, as the variance explained grew from 1 % to 7 % among the males and from 2 % to 8 % among the females after the measures of functional well-being were added. When the measures of physical well-being were entered after the measures of functional well-being, they added the variance

explained by 4 % among the males and by 3 % among the females. The total variances explained after the third block were the same in both models. The indicators of social well-being increased the explained variance among the males by 4 % and among the females by 5 %. Also satisfaction with life achievements proved to be a significant predictor of the GQOL perceptions in both models, increasing the explained variance among the males by 7 % and among the females by 4 %. However, there were significant changes after the measures of emotional well-being (STAI and BDI) had been entered into the models, as the variance explained grew among the males up to 22 % and among the females up to 23 %.

The mediator role of emotional well-being was examined by investigating the correlation coefficients and changes of the beta-coefficients after the variables measuring emotional well-being had been entered simultaneously into the regression models. The purpose was to investigate especially the mediator role of emotional well-being regarding the relationship between the GQOL (dependent variable) and physical well-being, functional well-being, social well-being, satisfaction with family life, and satisfaction with life achievements (independent variables). According to the model of mediators by Baron and Kenny (1986), the emotional well-being may be considered a mediator in the present sample when it meets the following conditions: (1) variations in levels of independent variables significantly account for variations in emotional well-being. (2) variations in emotional well-being significantly account for variations in the GQOL (VAS-QOL), and (3) when the relationships between the GQOL (VAS-QOL) and independent variables are controlled, a previously significant relation between the independent variable and the GQOOL (VAS-QOL) is no longer significant or decreases significantly. Regarding the first two conditions, there were statistically significant correlation coefficients between physical well-being, functional well-being, social well-being, satisfaction with family life, and satisfaction with life achievements and the measures of emotional well-being (1) and between (2) the measures of emotional well-being and the GQOL (VAS-QOL) (Appendix 2, Table 5). Regarding the third condition, it could be seen that among both genders significant decreases in the beta coefficients were found after the measures of emotional well-being had been entered into the models. Among the males physical

condition lost its significance, and the betas of perceived physical well-being (from -.20 to -.10), and satisfaction with life achievements (from .30 to .15), and satisfaction with family life (from -.17 to -.80) decreased from the fifth to the sixth step. Among the females perceived functional well-being and availability of social support lost their significance and the betas of physical well-being(from -.17 to -.80) and satisfaction with family life (from -.19 to -.10), satisfaction with life achievements (from .23 to .10) decreased. These results are consistent with a mediational model, indicating that the effects of these variables can be partly explained by the intervening mechanism of emotional well-being.

The collinearity statistics were analysed with the percentages calculated from the tolerance values. Physical well-being proved to be most strongly related to the other independent variables; 57 % among the males and 48 % among the females of its variability could be explained by the other predictors. The least variability could be explained with the other independent variables of variability of the measure "satisfaction with life achievements"; among the males 26 % and among the females 20 % (non-significant availability of the social support scale SSQ6, not included).

4.5 Factors related to the global quality of life among the transplantation patients (additional results)

Tables 8-9 (Appendix 2) show the results of hierarchical regression conducted following the analyses in the population study. The betas are presented step by step and the F-statistics and total R^2 are taken from the models after all the factors had been entered into the models. In the first model concerning the patients with a follow-up $\leq$ 36 months (Appendix 2, Table 8), physical well-being proved to be the most important predictor of the GQOL, increasing the variance explained by 54 %. The other variables did not increase significantly the variance explained, and no significant R-square changes were noticed. At the final fifth step in the block of emotional well-being, depressive mood (POMS-DD) proved to be a significant predictor, though the variance explained (5 %) did not exceed statistical signifigance. In the second model describing the patients with follow-up time of more than 36 months (Appendix, Table 9) physical well-being increased

the variance explained only by 5 %, the change was not statistically significant. However, when the measure of social support was entered into the model, the variance explained grew by 14 % and this R-square change was statistically significant. After the final fifth step, when the measures of emotional well-being had been entered, the variance explained grew by 16 % and the change of the R-square was statistically significant. In the final step the measure of depression remained the only statistically significant variable in the model.

5. Discussion

5.1 The main results

In the present study the global quality of life among allogeneic stem cell transplantation patients and in the Finnish population as well as the health-related quality of life among allogeneic stem cell transplantation patients were studied. It was found that at various time points during the recovery process after the stem cell transplantation different factors predominated in a person's life significantly influencing his/her global quality of life (I). Physical well-being proved to be a significant determinant of the global QOL until three years from the SCT. Among the respondents with one to three years' follow-up also the age at SCT proved to be a significant predictor, indicating that patients transplanted at an older age perceived more satisfaction with their QOL than those transplanted at a younger age. After five years post-SCT satisfaction with social support and education proved to be significant determinants of the GQOL. The patients who considered their social support good and who had good education experienced more satisfaction with their QOL.

The results indicated that physical and functional well-being improved over time after the allogeneic stem cell transplantation. Furthermore, work, gender, age at stem cell transplantation, existence of graft versus host disease, and current age had impact on the various areas of the HRQOL (I, II).

Stressful problems related to haematological diseases and allogeneic stem cell transplantation were detected using concept mapping methodology. It was chosen, as it allowed the patient (the true "expert") to define the domains under investigation.

In the Finnish population good physical, functional, and social well-being as well as higher age, better economic situation, and higher satisfaction with life achievements indicated a better GQOL and were thus found to be important factors of the GQOL. However, the variances explained with these variables were only moderately high compared to the measures of emotional well-being. Consequently the results of the present study indicated that global QOL judgements are likely to be based on the current emotional state (IV).

The additional analyses describing the determinants of the GQOL among the SCT patients in the follow-up groups confirmed the earlier analyses that the impact of the determinants of the GQOL varies during the recovery process.
The analyses of correspondence of the determinants of the GQOL in the Finnish population and among the SCT patients showed that emotional well-being proved to be the strongest determinant of the GQOL among the SCT patients after three post-SCT years as well as in the population sample. Among the SCT patients especially the depressive mood indicated a lower GQOL. In the population sample the magnitudes of the coefficients between the measures of emotional well-being and the GQOL were nearly similar between the males and the females.

5.2 Fluctuations of the global quality of life in the course time and associated factors among the transplantation patients

While no significant differences regarding the GQOL between the follow-up groups after the SCT were found, the percentage of the patients with a high level of satisfaction was markedly lower during the first year after the SCT. In accordance with the earlier studies, (Sutherland et al.,1997, Stafelt, 1994, Bush et al., 1995, Schmidt et al.,1993, Broers et al.,

2000) in the follow-up groups of more than one year after the SCT, the percentages of recipients indicating much/very much satisfaction with life ranged around 80 %.
The results of the present study also showed that at various time points during the post-SCT recovery process the factors that significantly included the global QOL changed. During the first three years after the SCT physical well-being proved to have a highly significant relationship with the GQOL being the strongest predictor of the GQOL. Also in the study by Boers et al. (2000) changes in the GQOL could be explained entirely by changes in the functional limitations and somatic symptoms after three years since the SCT.

In the present study it was also found that among recipients with a follow-up time of one to three years the age at SCT proved to be a significant predictor, indicating that the patients transplanted at an older age perceived more satisfaction with their QOL than those transplanted at a younger age. The patients under 40 years of age were found to be less satisfied with their current QOL as compared to the patients over 40 years of age when physical well-being was accounted for. Greenberg et al. (1997) found that young age at transplantation predicted poor psychological state. Also among heart transplantation patients similar phenomena have been found. In a study by Grady et al.(1999) one year after heart transplantation older age predicted better life satisfaction. This result can be interpreted in terms of the life-span developmental perspective, i.e. the problems confronting SCT survivors would be expected to be experienced differently at different stages of the life cycle (Rowland,1989). Shortly after the SCT younger patients may find themselves more impaired in comparison with their agemates than the older recipients. Older patients may have fewer non-health stressors related to family life and career.

In the group of recipients of five years post-SCT education and social support proved to be the most important predictors. Andrykowski et al. (1989) found that increased educational attainment was associated with better post-SCT QOL outcomes and concluded that more educated patients were employed in physically less demanding occupations, thus reducing the likelihood of post-SCT occupational difficulties.

5.3 Health-related quality of life among the transplantation patients (I, II)

The present study indicated that the greatest improvement in the physical well-being can be expected after the first year since the SCT. However, a small proportion of the patients examined herein continued to have physical problems even several years after the SCT. Depending on the symptom evaluated, from one to eight per cent of the patients experienced some physical symptoms often or very often. This result is in accordance with a few other studies. Bush and colleagues (1995) found that five per cent of the survivors reported their health status as poor.

In the study of Andrykowski et al. (1997) six per cent of the patients evidenced severe problems related to the lack of energy and eight per cent reported severe sleep problems. Impairment in sexual functioning has also been reported after the SCT (Baker et al., 1991, Molassiotis et al., 1996, Andrykowski et al.,1995a, Andrykowski et al.,1995b, Mumma et al., 1992, Wingard et al., 1992, Prieto et al.,1996, Watson et al.,1999).
Andrykowski et al. (1997) suggested that sleep and energy difficulties may become chronic among SCT patients. Their data did not show any strong correlation between the incidence and the severity of sleep and energy problems and the passage of time post-HSCT. The results of this study indicated that the incidence of these symptoms was related to gender. In the group of male recipients, sleep quality and fatigue proved to be significantly associated with the follow-up interval, indicating a better HRQOL in the passage of time.

In the present study, 6 % of the males and 28 % of the females living with their mate reported low levels of satisfaction with their sexual life. Among the Finnish general population, 4 % of the males and 6% of the females considered their sexual life unsatisfactory (Aromaa, 1989). The present results indicate that sexual satisfaction among the male SCT patients appears to be congruent with the level of sexual satisfaction reported by the normal population. Among the female patients, however, problems regarding sexual satisfaction seem to be markedly more frequent than in the general

population. Interventions to increase the application of hormonal, mechanical, and behavioural methods to moderate sexual difficulties among female SCT recipients have been suggested (Syrjälä et al., 1998). The present study indicated that hormone replacement therapy alone may not be effective enough, as in the present sample most of the females had had hormone replacement therapy. The knowledge of females being more likely to experience decreased sexual satisfaction after the treatment is an important element in the pre-treatment consent process as well as in the post-treatment rehabilitation, helping couples to adjust to SCT.

The measures of emotional well-being also showed a consistent trend towards an improved HRQOL after the first year following the SCT. Anxiety and total mood disturbances were found to be high during the first year after the SCT. In the prospective study of Syrjälä et al. (1993) one third of the patients reported elevated levels of emotional distress throughout the first year after the SCT. The present results confirm their findings. In agreement with Syrjälä et al. (1993) it may be stated that patients and family members should be informed that emotional distress is not an unusual reaction to the HSCT both during the acute phase of the transplantation and over the first year of recovery. There is evidence (Grassi et al. 1996, Meyers et al., 1994, Leigh et al., 1995 and Boers et al. 2000) that anxiety levels before transplantation are higher but reduced afterwards. In the study by Boers et al. (2000) changes in psychological distress could not be explained entirely by changes in the physical condition, though there exits a strong relationship between them. The authors suggested that psychological problems may pre-exist or be caused by the diagnosis or progression of cancer, instead of the SCT *per se.* Their study partly supported the idea of Leigh et al. (1995) that psychological morbidity before the SCT might be predictive of psychological morbidity after transplantation.

Regarding functional well-being, one year after the SCT more than 90 % of the patients could manage without any help in their daily activities such as "walk outside", "walk inside", "do light work", "climb the stairs", and do their shopping (93 %). According to the mini-Finland study (Aromaa et al. 1989), shopping was found to be "difficult/not able to do" for approximately ten per cent of the Finns (aged 30-64 years). This comparison with the population data indicates that the SCT patients are likely to manage in their daily

activities as well as "an average Finn". Furthermore, 76 % of the SCT patients were able to work, 68 % of the patients were actively participating in work/school, and 8 % were unemployed. The present finding is rather similar to those of some earlier studies: Schmidt et al. (1993) reported that 74 % of the adult SCT recipients who had been employed at the time of diagnosis had returned to work, and in the study of Bush et al. 74 % of the allogeneic SCT recipients were employed. In accordance with the definitions of the HRQOL (Box 2, p. 17)) Baker et al. (1991) suggested in their study that one of the key ways that the HRQOL is mediated on an individual level is in terms of the effects which the illness and its treatment have on a person's ability to continue to engage in a valued role. Andrykowski et al. (1989) found that increased educational attainment was associated with better post-BMT QOL outcomes. According to these authors, the most obvious explanation is that more educated patients are employed in less physically demanding occupations thus reducing the likelihood of post-SCT occupational difficulties. Based on the results of this study, vocational rehabilitation services would offer an important component of post-SCT treatment programs, particularly for patients with a background of manual work and a low educational level. Rehabilitation needs were indicated especially by this group of the SCT patients. While these issues have received increasing clinical attention in the rehabilitation of individuals facing disability or retirement, they have traditionally been overshadowed by other concerns in the care of patients with life-threatening illnesses such as cancer (Peteet, 2000).

The measures of social well-being dimension did not indicate any significant differences between the follow-up groups. However, on an average, the availability of social support as well as satisfaction with social support declined after the first year post-SCT. The measures of availability of and satisfaction with social support indicated that during the first year since the SCT the patients scored as high as possible on these measures. One explanation for this result is that when a person becomes seriously ill his/her social network is likely to become alerted and the person will have special attention. After the treatment the need for help will diminish and the social network will be normalized.
It was, however, found that, regardless of the availability of social support and of marital status, the males were, on an average, less satisfied with their social support. In the

literature on social support, there is empirical evidence showing that gender differences do emerge when the quality, rather than the quantity, of relationships is measured. Studies have shown that females report a higher quality of relationships compared to their male counterparts (Belle 1987, Turner 1994, Shumaker & Hill,1991) This may, in part, be due to the fact that females in general appear to be more capable than males in providing and receiving emotional support (Turner, 1994). Fife et al. (1994) found that females benefit more from family support, but males from support provided by health care professionals. The gender difference in the perceived satisfaction with social support found in this study may be due to the fact that health care professionals are not as readily available as the family members to meet the needs of the patients (Greimel et al.,1989, Fife et al., 1994). Thus males may be in need of augmented and more structured social support from the hospital personnel.

Overall, the present study indicates, as does prior literature, that the most negative HRQL burden is apparent after the diagnosis of the disease, during the course of the therapy, and during the first year after the transplantation. However, most long-term survivors appear to recover to a normal state from the symptoms of the disease and the therapy-related adverse events, returning to a satisfactory level of the HRQOL, as was shown by measures of physical, functional, and emotional well-being. The initial decrement in the HRQL may be especially difficult, as it is related to the relatively new information provided by the diagnosis of cancer and the patients have to undergo a long-lasting transplantation procedure, with a long stay at hospital, uncertainty of the results, and complications caused by the therapies. Despite the initial distress, this study in line with most other studies, shows that most of the patients entering into complete remission are able to return to a normal state of well-being.

5.4 Problems identified by the patients and dimensions of stress related to haematological diseases and stem cell transplantation (III)

When investigating the impact of SCT on patients it is important that the analytic method employed captures direct patient perceptions, allowing the patient to define the domains

under investigation. In this study a multivariate analytic method, Concept Mapping (CM), was used to identify perceived stressors among the allogeneic SCT patients. Furthermore, it permitted an idiographic focus on the complexity of an individual's perceptions while providing results with nomothetic relevance. A number of stressors generated by the patients were quite novel identifying problems which were perceived important by the allogeic SCT recipients.

The multidimensional scaling and hierarchical cluster analyses were used to identify empirically the structure underlying the stressful problems produced by the SCT recipients. The analyses of the stress data resulted in an eight-cluster solution. The stress clusters, ranked from the most severe to the least severe, were identified as follows: Change of life and impact of long-lasting treatment; Side-effects; Distress related to treatment outcome and physiological status; Family-related stress; Fear of death and depressive thoughts; Other concerns; Negative social support; and Stress related to lack of information and the medical staff. Some of the stressors generated by the patients were unique and brought inside-information likely to be useful in clinical settings.

In agreement with previous studies (e.g. Somerfield et al., 1996), stress domains related to the physical impact of SCT such as "side-effects", "long-lasting treatment", and "physical outcome" were perceived, on an average, as the most intensive and the most uncontrollable, and they were also experienced most often. Somerfield et al. (1996) reported that interpersonal difficulties were the second most frequently reported concern in their study. These interpersonal difficulties extended over a wide range of domains, including loss of contact with other SCT patients, loss of support from significant others when returning home from hospital, difficulties maintaining intimacy in relationships, and restricted social life.

In the present study, however, the stress cluster describing family-related stress characterized by items like "Worries about the well-being of the family"; "Closest relatives were stressed" was perceived highly stressful, indicating an interactive role of family-related stress. In standard QOL questionnaires it is generally asked whether the

patient receives sufficient social support, but it is rarely asked how much the patient is worried about how the disease affects the family members or how much stress is derived from the family relationships. In a study by Toseland et al. (1995) it was found that the most pressing problems by caregivers were "fear of spouse dying", "living with uncertainty", and "spouse's emotional problems", creating a vicious circle. This interactive nature of family-related stress should be closely considered in the discussion of social support.

Negative aspects of "social support" described in the literature (e.g. Rowland, 1989, Wortman, 1984, Baker, 1990) were also identified in this study, but the severity of stress imposed by negative social support was slight. Also stress items describing the relationship with the hospital personnel were perceived as less burdensome. The most intensive stressor in this cluster was the way in which the diagnosis was communicated to the patient. In the Finnish medical system the diagnosis is not always given by an experienced specialist but, instead, by a primary physician not fully aware of the treatment possibilities in haematological diseases. Salander (2002) reported in his study that the most crucial issue for the patient at receiving the diagnosis is to have adequate information of the treatment (as a source of hope).

In regard to interventions, particular attention should be focused on the stressors having the most critical relationships with the patient's well-being, as well as on identifying new ways to reduce patient-experienced stress. The ratings by the patients indicated that the constant monitoring and communication of blood cell counts was a major source of stress. During the SCT process blood cell counts must be monitored for safety reasons to detect the need for platelet and red cell transfusions. However, the follow-up of the blood cell counts might have become a means of communication with the patient, and the whole recovery is understood to be crystallised in the increasing blood cell counts. According to the literature, concern over the loss of control is one of the most troublesome problems the cancer patients have to face (Northhouse & Northouse, 1988). Earlier studies (reviewed by Livneh, 2000) have directly addressed the impact of perception of control on psychosocial adaptation to cancer. The results of these studies generally suggest that

two perceptions are associated with better psychosocial adaptation and lower depression, one reflecting the patient's own control and the other the provider's control. The elevating blood cell counts are not under the patient's control, and therefore focusing on these counts was likely perceived highly stressful. Routines concerning communication about blood cell counts should be reconsidered and developed.

A further problem to be addressed to is how to alleviate the anxiety and fear of the family members. Reciprocity has been claimed to be a crucial element in well-functioning social support among the family members and patients (Hogan et al., 2002). However, one of the sources of high stress identified by the patients in this study was the family and the concern over the family well-being. Nelson et al. (1998) suggested group sessions to be held focusing on the specific informational needs of the patients and their family members. It has been shown that reciprocal social support demonstrates more encouraging results, suggesting that merely receiving support may not be as potent as the exchange of support (Hogan et al., 2002). In the context of the SCT this could help to ease the concern of the patients over their family members and to develop reciprocal social support in a way that would not become a burden to the patient. Some patients also indicated the need to meet persons who had undergone SCT. The literature does not give uniform support for the usefulness of peer groups. Coates et al. (1983) reported that peer-support groups have the potential to damage self-esteem by reinforcing identity as a member of a deviant or stigmatized group, or by negative social comparison. However, group interventions also have many potential benefits, including the instillation of hope, acceptance, belonging, and altruism and they are also intrinsically appealing as a means of improving support. But as Revenson et al. (1991) pointed out, support may be beneficial only at times when the person needs aid and is receptive to it.

5.5 Relationship between the global quality of life and its dimensions in the population (IV)

The results of the present study indicated that global QOL judgements are likely to be based on the current emotional state, though other domains such as perceived health,

number of diagnosed diseases, perceived functional status, satisfaction with family life, satisfaction with life achievements, and satisfaction with economical situation were associated with the global QOL.

Smith et al. (1999) hypothesized that perceptions of the QOL are based on a cognitive process which involves: (1) indentifying the relevant domain comprising the QOL, (2) determining where one stands in each domain, and (3) integrating the separate domain judgements into an overall QOL assessment. Thus, according to Smith et al. (1999), the QOL is multidimensional in the sense that subjects may simultaneously evaluate several dimensions to arrive to an overall judgement. The present results were more likely to support the ideas that global QOL judgements are not likely to be based on cognitive reasoning. In his causal theory Hyland (1992) states that the QOL is a causal sequence in which morbidity causes symptoms, symptoms cause problems, and problems cause affective evaluations.

Taylor (1981) has pointed out that humans prefer simple strategies to more complex ones. When faced with the task of evaluating all the domains of one's life, weighting the evaluations, and integrating the results into an overall judgement, one is likely to avoid the task and choose a simpler strategy. Thus, a person's emotional state at the time of the measurement may become a major reference point for the overall judgement reported. Fayers et al. (1997) made an important point by separating the causal indicators such as the health status from the effect indicators, such as the emotional state. Similarly, it has been shown that the underlying process may be more direct, with people actually using their mood as the information which their QOL judgment is based on (Schwarz and Clore, 1983).

It is also suggested that mood may increase access to congruent information. Thus being in a low mood increases access to the negative QOL information (Blaney, 1986).

5.6 Comparing the determinants of the global quality of life in the population and among the stem cell transplantation patients (additional results)

To study the correspondence of the determinants of the GQOL among the SCT patients and among the Finnish population additional analyses were conducted using conceptually similar variables among the SCT patients as in the population sample. The variables were also entered into the models in the same order as in the population sample. In the group of three or fewer years after the SCT physical well-being proved to be the strongest predictor of the GQOL and could explain most of the variance of the perceived GQOL of the patients. However, in the model describing a group of patients of more than three post-SCT years the significance of physical well-being disappeared, and the importance of emotional well-being, especially depression, inceased. These new analyses confirmed the earlier analyses that during the first three years after the SCT physical well-being is the most important determinant of the GQOL. In the group of SCT patients with more than three years since the transplantation, emotional well-being, especially lack of depressive mood, indicated a better GQOL. The distinction made by van Eys (1987) between "biological" and "psychological cure" following cancer treatment is of note here. Van Eys reports that in successful cancer treatment the underlying disease must not only be eradicated (biological cure), but the personal identities of the survivors should become less dominated by the fact that they have been diagnosed and treated for a malignant disease (psychological cure). In the passage of time the determinants of the GQOL among the SCT recipients were shown to become similar to those found to be the most important among the population. Thus, the present indicates that perceptions of the global QOL are not governed by symptoms related to the disease and SCT. It may be concluded that in this respect the SCT recipients have achieved "psychological cure". These analyses are in accordance with the statement of Aristoteles concerning the determinants of the GQOL:"When he falls ill he says it is his health, and when he is hard up that is money".

5.7 Validity and reliability of the study

The present study is based on two representative data sets as well as on well-known measures of the QOL dimensions with good psychometric qualities. The reliability estimates of the measures used were acceptably high. The response rates were also reasonably high in both of the data sets. The selection bias and its potential impact on the results are a concern when evaluating the results of both this study and other follow-up studies focusing on psychological/emotional functioning. The failure to capture patients functioning poorly, for example secondary to depression, may affect the results (Winer, 1994). In the present study it was possible to compare the non-respondents and respondents among the SCT patients. It was found that the non-respondents were characterized by a better functional status, they had a longer follow-up time, and they were younger at the time of their SCT. These findings lessen the risk that the current results are the product of a significant bias towards a poorer QOL among the non-respondents in the patient population.

In the present study only allogeneic SCT patients were studied. Some of the previous studies have combined the analyses of the QOL of autologous and allogeneic SCT patients, though patients undergoing these procedures are not comparable (Winer, 1994). The reluctance of the patients to reveal negative feelings about their treatment or outcomes concerning the caring hospital personnel is a potential source of response bias. Therefore, the present questionnaires were sent to a research centre not involved in the treatment of the patients. Additional biasing factors, such as those associated with the quality or availability of care resulting from unequal financial resources or insurance coverage, were also minimised in the present investigation due to the uniform availability of treatment guaranteed by the Finnish public health care system.

In the present study it was possible to use a sample of the Finnish population. This data set enabled to carry out the analyses of the concept of the GQOL, not only from the patients perspective, but also from the perspective of the general population.

Regarding the sample of the Finnish population, it was found that those who scored higher on the depression scale were more likely not to answer the question measuring their global QOL. The result shows that people with more depressive symptoms did not have persistence to fill up all the questions including the last question measuring the GQOL. This might indicate that the population sample gives a rosier picture of the GQOL among the Finnish population. The purpose of the present study was not to compare the GQOL between these two samples. Instead, the purpose was to investigate the determinants of the GQOL. It is reasonable to assume that the relationship between the GQOL and its determinants is not significantly affected by the bias found in the population sample.

The dimensions of the GQOL and GQOL were measured in both study populations using different measures. Although the used measures have been shown to have good psychometric properties, the conclusions regarding the correspondence of the determinants of the GQOL drawn here must be considered with caution. Especially the differences in the measurement of the GQOL have to be taken into account. In the patient population the subjects were asked to indicate their "satisfaction with their current quality of life", and in the population study they were asked to "estimate their overall quality of life". There is a difference in the meaning of these questions, which may have affected the results. However, regarding the content validity it is reasonable to assume that the content domain of both of the measures is appropriately relative to its intended use. Similarly, both of the measures indicate construct validity. Common methods to obtain construct validity include an examination of the logical relations that should exist with other measures and/or patterns of scores across individuals. In both samples these logical relations could be seen. Criterion measures are measures of the target construct that are widely accepted as valid measures of that construct (Lohr et al., 1996). Regarding the criterion validity, correlation coefficients between the GQOL measures and the measures of the GQOL components indicated good criterion validity.

Furthermore, the measures of emotional well-being were different in the study groups. In the population study the measure of depression (the BDI) measured depressive

symptoms. In the patient population the measure of depression (the POMS) measured depressive mood state.

The cross-sectional design of the study does not allow to draw conclusions regarding the causal relationship between the determinants of the GQOL and HRQOL among allogeneic SCT patients. Prospective studies are needed to understand better the impact of treatment and disease-related factors on the QOL of the patients.

Due to the small sample size of the SCT recipients, minor effects could not be found, and thus occurrences of type II errors became likely when the SCT patients were stratified according to the post-SCT time. It is suggested that non-significant F occurs, because there is no actual effect (phenomenon of interest is not present) or because the power of the study is insufficient to detect the effect (Keppel, 1991). In HRQOL research it may be especially important to find even minor effects, for example possible side-effects of the treatment (Pedhazur and Pedhazur-Schmelkin, 1991).

The results of the present study are mostly in accordance with the international studies referred to as well as with the supplement findings of these studies.

The effect of the response shift on the results of the present study among the SCT patients is difficult to determine. Only one measurement was done not including measures like the thentest. It is possible that the evaluations of the patients concerning the GQOL and HRQOL have changed during the recovery process. It has been documented that people search for a meaning when facing a life-threatening illness, in particular by seeing one's life as improved by the illness (Janoff-Bulman, 1992, Fife 1995). People threatened by death have been described to be less troubled by minor stresses and appreciating life more than before (Wood, 1994). In this way, satisfaction with life can be maintained in the face of serious illness (Cohen & Mount, 1992). Surviving allogeneic SCT, as a therapy for an aggressive form of cancer, might lead to a relief and re-evaluation of life and, thus, to a high perceived GQOL. On the other hand, the results of this study revealed that during the first years after the SCT, the GQOL was strongly related with physical

well-being but the importance of the dimensions of physical well-being diminished in the follow-up group of five years since the SCT. Secondly, significant differences were found between the follow-up groups regarding the components of the HRQOL. Thirdly, regarding the functional well-being, most of the patients had returned to work or school after the first year since the SCT and most of them were able to participate in their daily activities without difficulties. Combining these three findings it is reasonable to conclude that they indicate "true" changes in the GQOL and HRQOL which cannot be explained only with changes in the evaluations of the patients.

5.8 Theoretical and clinical implications of the study

The results regarding the fluctuations of the relationship between the GQOL and its determinants among the transplant patients support the deprivation theory of Michalos (1986), according to which people value what they have lost or aspire to get.
It may be presumed that during the first acute phase of the recovery process problems related to health dominate life and have direct impact on the perceptions of the QOL. After three years when the life has normalized the impact of health has diminished and similar things as in the population become more important.

The results regarding the strong impact of emotional well-being on the judgements of the GQOL in the population sample and in the patient sample after three years since transplantation were in accordance with the causal theory of Hyland (1992). Furthermore, the present results supported the suggestions that the emotional state should be studied, not as one independent dimension of the QOL, but as a mediator variable with a major influence on how causal indicators of the QOL are translated into the GQOL. The suggestions of Fayers et al. (1997) offer an explanation for the high impact of the measures of the emotional state in the present study. According to Fayers et al. (1997), the emotional state is an effect indicator of the QOL. Due to the nature of the GQOL construct, a perfect effect indicator would have a correlation of 1 with the GQOL and would therefore suffice as a single item to determine a patient's GQOL. A causal indicator (e.g. health), on the other hand, could only attain a correlation of 1 with the

GQOL if it is the only thing that influences a person's GQOL. However, there are multiple factors affecting the perceptions of the GQOL, related to both health and to other aspects of life. To overcome an effect indicator in the statistical model the causal indicator has to be very strong, as health might be in the situation when a person's existence is threatened.

Conceptual comparisons of the global quality of life indicated that the structure of the concepts is similar in both study groups, giving support to the assumption that the GQOL among the long-term survivors of allogeneic SCT is determined by the same factors as among the Finnish population.

The present study also gave evidence that different things during the recovery process become important in the GQOL of the SCT patients. The results support the assumption that perceptions and evaluations of an individual's life are strongly related to the situational factors.

The results of the present study support the premise that the large majority of long-term allogeneic SCT patients express satisfaction with their GQOL and describe themselves as living without significant physical, functional, emotional, and social problems related to their disease or the SCT treatment. Also, a number of dimensions were identified that deserve attention during the post-transplant treatment phase. Patients receiving a transplant at a younger age appear to need more emotional guidance and counselling, even years after their SCT. The expressed need to incorporate vocational rehabilitation as part of the post-SCT treatment is particularly striking, as such efforts have not been included in the majority of existing treatment programs.

The present results indicated that important gender differences exist among allogeneic SCT recipients which need to be addressed when designing post-treatment intervention programs for SCT recipients. The present investigation supports the need to examine further the role of gender when evaluating the outcome of the SCT patients. This conclusion is buttressed by the illustration that the gender-based differences among the SCT patients noted herein exceeded the differences found in the Finnish population.

Based on the present results it can be suggested that these gender-based relationships represent potentially important factors which need to be addressed to both in research and clinical practice.

The present study extended the knowledge about the SCT-related stress dimensions in at least two important ways. First, it provided detailed data on specific stressors experienced by SCT patients. Secondly, it identified the perceptual domains underlying these specific stressors used by SCT patients to organize their experience. The study also provided valuable information about how SCT patients evaluate these domains. The results of the study have been shared with the personnel of the hospital, and insight and practically useful information have been thus provided for the persons working with SCT patients.

References

Ahmed, S., Mayo, N.E., Wood-Dauphinee, S., Hanley J.A. & Cohen, S. R. (2004). Response shift influenced estimates of change in health-related quality of life poststroke. *Journal of Clinical Epidemiology*, 57, 561-570.

Albrecht, G.L. (1994). Subjective health assessment. In: Jenkinson, C.(Ed.), *Measuring health and Medical Outcomes*, (pp. 7-26) London: UCL Press.

Albrecht, G.L. & Devlieger, P.J. (1999). The disability paradox: high quality of life against all odds. *Social Science and Medicine*, 48, 977-988.

Allison, P. J., Locker, D. & Feine, J. S. (1997). Quality of life: A dynamic construct. *Social Science and Medicine*, 45, 221-330.

Anasetti, C., Beatty, P. G. & Storb, R. (1990). Effect of HLA incompatibility on graft versus host disease, relapse, and survival after marrow transplantation for patients with leukemia or lymphoma. *Human Immunology*, 29, 79–91.

Andrews, F. & Withey, S. (1976) *Social indicators of well-being: Americans perceptions of life quality.* Plenum: New York: Plenum.

Andrykowski, M.A., Henslee, P.J., Farral, M.G. (1989) Physical and psychosocial functioning of adult surviviors of allogeneic bone marrow transplantation. *Bone Marrow Transplanatation,* 4, 75-81.

Andrykowski, M. A., Brady, M. J. & Hunt, J. W. (1993). Positive psychosocial adjustment in potential bone marrow transplant recipients: cancer as a psychosocial transition. *Psycho Oncology*, 2, 261-276.

Andrykowski , M.A, Brady, M.J.. Greiner, C.B. Altmaier, E.M., Burish, T.G., Antin, J.H., Gingrich, R., McCarigle, C. & Henslee-Downey, P.J. (1995a). Returning to normal' following bone marrow transplantation: outcomes, expectation and informed consent. *Bone Marrow Transplantation*, 15, 573–581.

Andrykowski , M.A., Greiner, C.B. Altmaier, E.M., Burish, T.G., Antin, J.H., Gingrich, R., McCarigle, C. & Henslee-Downey, P.J., (1995b). Quality of life following bone marrow transplantation: findings from a multicentre study. *British Journal of Cancer*, 71, 1322–1329.

Andrykowski, M. A., Carpenter, J. S., Greiner, C. B., Altmaier, E.M., Burish, T.G., Antin, J.H., Gingrich, R., Cordova, M. J., Henslee-Downey, P. J. (1997). Energy level and sleep quality following bone marrow transplantation. *Bone Marrow Transplantation*, 20, 669-679.

Argyle, M., Martin, M. & Lu, L. (1995). 'Testing for stress and happiness: role of social and cognitive factors', in Spielberger, C. D. & Sarason, I.G. (Eds.), *Stress and Emotion*, Washington DC, Taylor and Francis.

Aristotle, (384–322 BC), *Ethica Nichomachea*.

Aromaa, A., Heliövaara, M., Impivaara, O. Kneckt, P., Maatela, J., Joukamaa M, Klaukka, T., Lehtinen, V., Melkas, T.,Mälkiä, E.,Nyman, K., Paunio, I., Reunanen, A., Sievers, K., Kalimo, E. & Kallio, V. (1989) Terveys, toimintakyky ja hoidontarve Suomessa. *English Summary: Health, functional limitations and need for care in Finland; Basic results from the Mini-Finland Health Survey*. Kansaneläkelaitos, Helsinki.

Baker, F., Curbow, B. & Wingard, J.R. (1991). Role retention and quality of life of bone marrow survivors. *Social Science and Medicine*, 32, 697-704.

Baker, F. & Polland, A. (1990). *Community reintegration of cancer survivors after bone marrow transplantation*. Proceedings of the Seventh Annual Community Psychology Conference. Burlington, Vermont, October.

Barofsky, I. (1989). Work: issues and concepts. In: Barofsky I (ed) *Work and illness: the cancer patient*. (pp 3-24). New York, Praeger.

Baron, R. M. & Kenny, D. A. (1986) The moderator-mediator variable distictiontion in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173-1182.

Barr, T. A., Stallbaum, B.A., Chao, N. J. & Blume, K. G. (1993). Extended follow-up in 212 long-term allogeneic bone marrow transplant survivors. *Transplantation*, 55, 551-557.

Bar-Tal, Y., Cohen-Mansfield, J. and Golander, H. (1998). Which stress matters? The examination of temporal aspects of stress. *Journal of Psychology*. 5**,** 569-576.

Beck, A.T., Ward, C. H., Mendelson, M, Mock, J.,& Erbaugh, J. (1961). An inventory of measuring depression. *Archives of general psychiatry*, 4, 561-571.

Belec, R. H. (1992). Quality of life: perceptions of long-term survivors of bone marrow transplantation. *Oncology Nursing Forum*, 19, 31–37.

Belle D. (1987). Gender differences in the social moderators of stress. In Barnett, R.C., Biener, L.& Bamch, G. K. (Eds.), *Social support and health*. New York, Academic Press.

Blaney, R.H. (1986). Affect and memory: A review. *Psychological Bulletin*, 99, 229–246.

Bortin, M. M. & Rimm, A. A. (1989). Increasing utilization of bone marrow transplantation: II. Results of the 1985–1987 survey. *Transplantation*, 48, 453–458.

Bowling, A. (1991). *Measuring health*. *A review of Quality of Life Measurement scales*. Philadelphia: Milton Keynes. Open University Press.

Bowling, A. (1995). *Measuring disease. A Review of Disease Specific Quality of Life Measurement Scales,* pp. 1-16, Buckingham, Open University Press.

Bowling, A. & Windsor, J. (2001). Towards the good life: Apopulation survey of dimensions of quality of life, *Journal of Happiness Studies*, 2, 55-81.

Brady, M. J., Cella, D. F., Mo, F., Bonomi, A. E., Tulsky, D. S., Lloyd, S. R., Deasy, S., Cobleigh, M. & Shiomoto, G. (1997) Reliability and validity of the Functional Assessment of Cancer Therapy-Breast quality-of-life instrument. *Journal of Clinical Oncology*, 15, 974–986.

Breetvelt, I. S. & Van Dam, F. S. A. M. (1991). Underreporting by cancer patients: the case of response shift. *Social Science and Medicine*, 32: 981–987.

Broers, S., Kaptein, A., Cessie, S. L., Fibbe, W.& Hengeveld, M. W. (2000). Psychological functioning and quality of life following bone marrow transplantation.A 3-year follow-up study. *Journal of Psychosomatic Research* ,48, 11-21.

Brooks, M.N., Gorkin L., Schon E.B., Wiklund I., Campion J. & Ledingham. (1994). Moricizine and quality of life in the Cardiac Arrhythmia Suppression Trials II (CAST II), *Controlled Clinical Trials* 15, 437-449.

Bullinger, M. (1997). The challenge of cross-cultural quality of life assessment. *Psychology & Health* [Special Issue: Quality of life: Recent advances in theory and methods],12, 815-825.

Bush, N.E., Haberman, M., G. Donaldson G. & Sullivan, K.M. (1995). Quality of life in 125 adults surviving 6–18 years after bone marrow transplantation. Social Science & Medicine, 40, 479–490.

Calman KC. (1984). Quality of life in cancer patients: an hypothesis. *Journal of Medical Ethics*, 10, 245-51.

Campbell, A., Converse, P. & Rodgers, W. (1976). *The quality of American life*, New York: Russell Sage Foundation,

Campbell, A. (1981). *The sense of well-being in America*. McGraw-Hill: New York.

Cantril, H. (1965). *The pattern of human concern*. Rutgers University Press: New Brunswick.

Carr, A. J. & Higginson, I. J. (2001). Measuring quality of life: Are quality of life measures patient centred? *British Medical Journal*, 322 ,1357-1360.

Casali, P., Licitra, L., Costantini M, Santoro, A., Viterbori, P., Bajetta, E.& Bruzzi, P. (1997). Quality of life assessment and clinical decision making. *Annals of Oncology*, 8, 1207–1211

Cassileth, B. R., Lusk, E. J., Strouse, T. B., Miller, D. S., Brown, L. L., Cross, P. A. & Tenaglia, A. N. (1984). Psychosocial status in chronic illness. A comparative analysis of six diagnostic groups. *New England Journal of Medicine*, 311, 506–511.

Cella, D. F. (1992). Quality of life: the concept. *Journal of Palliative Care* 8, 8–13.

Cella, D. & Nowinski C.J. (2002). Measuring Quality of Life in Chronic Illness: The Functional Assessment of Chronic Illness Therapy Measurement System. *Archives of physical medicine and rehabilitation*, 83, 10-17.

Cella, D. F., Tulsky, D. S., Gray, G., Sarafian, B., Linn, E., Bonomi, A., Silberman, M., Yellen, S. B., Winicour, P., Brannon, J.et al. (1993). The Functional Assessment of Cancer Therapy scale: development and validation of the general measure. *Journal of Clinical Oncology*, 11(3), 570-9.

Claas, F. H. J. (2003). Towards clinical transplantation tolerance, *The Lancet*, 361, 1489-1490.

Coates, D., Renzaglia G., J. & Embree, M.C. (1983). When helping backfires: Help and helplessness. In J.D. Fisher and A. Nadler (eds.), *New Direction in Helping, vol. 1, Recipients Reactions to Aid.* New York, Academic Press.

Cohen, S. R. & Mount, B. M. (1992). Quality of life in terminal illness: defining and measuring subjective well-being in the dying. *Journal of Palliative care*, 8, 40-45.

Cronbach, L. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika* 16. 297–334.

Croog, S. H., Levine, S., Testa, M. A., Brown, B., Bulpitt, C. J., Jenkins, C. D., Klerman, G.L., Williams, G.H**.** (1986). The effects of antihypertensive therapy on the quality of life. *New England Journal of Medicine*, 314, 1657–1664.

Croog, S. H , Kong, B. W, Levine, S., Weir, M. R., Baume, R. M. & Saunders, E. (1990). The Black Hypertension Quality of Life Multicenter Trial Group. Hypertensive black men and women: quality of life and effects of antihypertensive medications. *Archive Internal Medicine*, 150, 1733–1741.

Cummins, R. (1996). The domains of life satisfaction. An attempt to order chaos. *Social Indicators Research*, 38, 303-328.

Cummins, R. (1997). 'Assessing quality of life', in Brown, R.(Ed), Quality of life for people with disabilities: models, research and practise, Cheltenham: Stanley Thornes.

Daltroy, L. H., Larson, M. G., Eaton, H. M., Phillips, C. B., & Liang, M. H. (1999). Discrepancies between self-reported and observed physical function in the elderly: the influence of response shift and other factors. *Social Science & Medicine*, 48, 1549–1562.

Dissart, J. C. & Deller, S. C. (2000). Quality of life in the planning literature. *Journal of Planning Literature*, 15, 135–161.

Editorial. (1995), Quality of life and clinical trails. *Lancet*, 346, 1–2.

Edman, L., Larsen, J., Hagglund, H. & Gardulf, A. (2001). Health-related quality of life, symptom distress and sense of coherence in adult survivors of allogeneic stem-cell transplantation. *European Journal of Cancer Care*, 10, 124-130.

van Eys, J. (1987). Living beyond cure: Transcending survival. *American Journal of Pediatric Hematology Oncology,* 9, 114–118.

Fairclough, D. & Cella, D. (1996). Functional Assessment of Cancer Therapy (FACT-G): non-response to individual questions. *Quality of Life Resesearch,* 5, 321–329.

Farquhar, M. (1995). Definitions of quality of life: a taxonomy. *Journal of Advanced Nursing*, 22, 502–508.

Fayers, P. M., Hand, D. J., Bjordal, K. & Groenvold, M. (1997). Causal indicators of life research. *Quality of Life Research*, 6, 393-406.

Fayers, P. M. & Hand, D. J. (1997).Generalisation from phase III clinical trials: survival, quality of life, and health economics. *Lancet*, 350, 1025–1027.

Felce, D. & Perry, J. (1996). Assessment of quality of life. In Schalock, R. L. (Ed.), *Quality of life: Vol 1. Conceptualization and measurement* (pp. 63-72). Washington DC: American Association on Mental Retardation.

Ferrans, C. E. & Powers, M. J. (1992). Psychometric assessment of the quality of life index. *Research Nursing Health*, 15, 29-38.

Fife, B. L. (1995). The measurement of meaning in illness. *Social Science & Medicine*, 40, 1021-1028.

Fife, B. L., Kennedy, V. N. & Robinson, L. (1994). Gender and adjustment to cancer: Clinical implications. *Journal of Psychosocial Oncology*, 12, 1-20.

Flanagan, J. C. (1978). A research approach to improving quality of life. *American Psychologist*, 33, 138- 147.

Flanagan, J. C. (1982). Measurement of quality of life: current state of the art. *Archives of Physical Medicine and Rehabilitation*, 63**,** 56–69.

Florio, G. A., Donnelly, J. P., Zevon, M. A. (1998). The structure of work-related stress and coping among oncology nurses in high-stress medical settings: A transactional analysis. *Journal of Occupational Health Psychology*, 3, 227-242.

Friedland, J., Renwick, R. & McColl, M. (1996). Coping and social support as determinants of quality of life in HIV/AIDS. *AIDS Care,* 8, 15–31.

Ganz, P. A., Coscarelli, A., Schag, C. A, Lee, J. J., Polinsky, M. L. & Tan, S. J. (1992). Breast conservation versus mastectomy. Is there a difference in psychological adjustment or quality of life in the year after surgery?, *Cancer,* 69, 1729–1738.

Ganz, P. A., Hirji, K., Sim, M. S., Schag, C. A., Fred, C. & Polinsky, M. L. (1993) Predicting psychosocial risk in patients with breast cancer. *Medical Care,* 31, 419–431.

Ganz, P. A. (1994). Quality of life and the patient with cancer. Individual and policy implications. *Cancer*, 15 (Suppl. 4), 1445–1452.

Gill, T. M. & Feinstein, A. R. (1994). A critical appraisal of the quality of quality of life measurements. *Journal of the American Medical Association*, 272, 619–626.

Gotay, C. C., Korn, E. L., McCabe, M. S., Moore, T. D. & Cheson, B. D. (1992). Quality-of-life assessment in cancer treatment protocols:research issues in protocol developments. *Journal of National Cancer Institute*, 84, 575-79.

Grassi, L., Rosti, G., Albertazzi L. & Marangolo, M. (1996). Psychological stress symptoms before and after autologous bone marrow transplantation in patients with solid tumors. *Bone Marrow Transplantation*, 17, 843–847.

Gratwohl, A., Schmid, O., Baldomero, H., Horisberger, B., Urbano-Ispizua, A. (Accreditation Committee of the European Group for Blood and Marrow Transplantation) (2004). Haematopoietic stem cell transplantation (HSCT) in Europe 2002. Changes in indication and impact of team density. A report of the EBMT activity survey. *Bone Marrow Transplantation*, 34, 855-75.

Greenberg, D. B., Kornblith, J. E., Herndon, J. E. , Zuckerman, E., Schiffer, C. A. Weiss, R. B. Mayer, R.J., Wolchok, S.M., & Holland, J,C. (1997). Quality of life for adult

leukaemia survivors treated on clinical trials of Cancer and Leukemia Group B during the period 1971-1988: predictors for later psychologic distress. *Cancer*, 80, 1936-1944.

Greimel, E. R., Padilla, G. V. & Grant, M. M. (1989). Gender differences in outcomes among patients with cancer. *Psycho-Oncology*, 7, 197-206.

Guyatt, G. H., Feeny, D. H. & Patrick, D. L. (1993). Measuring health-related quality of life. *Annals of Internal Medicine*, 118, 622-629.

de Haes, J. C. J. M. & van Knippenberg, F. C. E. (1985). The quality of life of cancer patients: a review of the literature. *Social Science & Medicine,* 20, 809–17.

Halpern, A. S. (1993). Quality of life as a conceptual framework for evaluating transition outcomes. *Expceptional Children*, 59, 486-498.

Harner, C. J. & Heal, L. W. (1993). The multifaceted Lifestyle Questionnaire (MLSS): Psychometric properties of an interview schelude for assessing personal satisfaction of adults with limited intelligence. *Research in Developmental Disabilities*, 14, 221-236.

Hays, R. D., Sherbourne, C. D. & Manzel, R. M. (1993). The RAND 36-Item Health Survey 1.0, *Health Economics*, 2, 217-227.

Hickey, A., O'Boyle, C. A., McGee, H.M. & Joyce, C. R. B. (1999).The schedule for the evaluation of individual quality of life. In Joyce, C.R.B., O'Boyle, C.A. & McGee H. (Eds), *Individual Quality of Life*, Singapore, Harwood academic publishers.

Hjermstad, M. J.& Kaasa, S. (1995). Quality of life in adult cancer patients treated with bone marrow transplantation—a review of the literature *European Journal of Cancer,* 31, 163-173.

Hogan, B. E., Linden, W. & Najarian, B. (2002). Social support interventions: Do they work? *Clinical Psychology Review*, 22, 381–440.

Holland, R. & Cullen, A. (1986). New insights and attitudes. In Holleh, A. I (Ed), *The American Cancer Society Cancer Book*, S. New York, Doubleday.

Holzner, B., Kemmler, G., Sperner-Unterweger, B., Kopp, M., Dünser, M., Margreiter, R., Marschitz, I., Nachbaur, D., Fleischhacker, W. W.& Greil, R. (2001).Quality of life measurement in oncology—a matter of the assessment instrument? *European Journal of Cancer*, 37, 2349-2356.

Howard, G.S. & Dailey, P.R. (1979) Response-shift bias: a source of contamination of self-report measures. *Journal of Applied Psychology*, 64, 144-50.

Howard, G. S. (1979) Interval invalidity in pretest self-report evaluations and a re-evaluation of retrospective pretests. *Journal of Applied Psychology*, 64, 1

Hunt, S. M., McEwen, J. & McKenna, S. P. (1985). Measuring health status: a new tool for clinicians and epidemiologists. *The Journal of the Royal College of General Practitioners* , 35, 185-88.

Hunt, S.M. (1997). The problem of quality of life. *Quality of life research*, 6: 205-212.

Hyland, M. E. (1992). A reformulation of quality of life for medical science. *Quality of Life Research*, 1, 267-72.

Hyland, M. E. & Sodergren, S. C. (1996). Development of a new type of global quality of life scale, and comparison of performance and preference for 12 global scales. *Quality of Life Research*, 5, 469-480.

Irwin, P. H., Allen, G., Kramer, S. & Danoff, B. (1982). Quality of life after radiation therapy: a study of 309 cancer survivors. *Social Indicators Research*, 10, 187-210.

Janoff-Bulman,R. (1992). *Shattered assumptions: towards a new psychology of trauma*. Free Press, New York, NY.

Jones, P.W., Baveystock, C. M. & Littlejohn, P. (1989). Relationships between general health measured with the Sickness Impact Profile and respiratory symptoms, physiological measures, and mood in patients with chronic airflow limitation. *The American review of respiratory disease*, 40, 1538–1543.

Karnofsky, D. A. & Burchenal, J. H. (1949). The clinical evaluation of chemotherapeutic agents in cancer. In Macleod, C. M. (Ed), *Evaluation of chemotherapeutic agents*, Colombia Univ Press, New York, pp. 195–205.

Katz S, Downs T. D., Cash, H. R., Grotz, R. C.(1970). Progress in development of the index of ADL. *The Gerontologist*, 10, 20-30.

Keppel, G. (1991). *Design and Analysis: A Researcher's Handbook*, Prentice Hall, Englewood Cliffs, 3 rd edition.

King, C. R., Haberman, M, Berry, D., Bush, N., Butler, L., Dow, K. H., Ferrell, B., Grant, M., Gue, D., Hinds, P., Kreuer, J., Padilla, G., & Underwood,S. (1997). Quality of life and the cancer experience: the state of knowledge. *Oncology Nursing Forum*, 24, 27–41

Kopp, M., Schweigkofler, H., Holzner, B., Nachbaur, D., Niederwieser, D., Fleischhacker, W.W. & Spener, B. (1998). Time after bone marrow transplantation as an important variable for quality of life: results of a cross-sectional investigation using two different instruments for quality-of-life assessment. *Annals of Hematology*, 77, 27-32.

Kornblith, A. (1998). Psychosocial Adaptation of Cancer Survivors. In Holland, J.C. & Rowland, J. H. (Eds), *Psycho-oncology*. New York, Oxford.

C. Laine, C. & Davidoff, F. (1996). Patient-centered medicine: a professional evolution. *JAMA* ,275, 152–156.

Lazarus, R. S. & Folkman, S. (1984). Coping and adaptation. In Gentry, W, D.(Ed.), *Handbook of Behavioral Medicine* (pp. 282-325). New York: Guildford Press.

Lazarus, R. (1993). Coping theory and research: Past, present, and future. *Psychosomatic Medicine,* 55, 234-247.

Leidy, N. K., Revicki, D. A. & Geneste, B. (1999). Recommendation for evaluating the validity of quality of life claims for labelling and promotion. *Value Health*, 2, 113-27.

Leigh, S., Wilson, K. C. M.,. Burns, R. & Clark, R. E. (1995). Psychosocial morbidity in bone marrow transplant recipients: a prospective study. Bone Marrow Transplantation, 16, 635–640.

LeVois, M., Nguyen, T. D. & Attkisson, C. C. (1981). Artefact in client satisfaction assessment: experience in community mental health settings. *Evaluation.and Program. Planning.* 4, 139–150.

Lepore, S. J. & Eton, D. T. (2000). Response shifts in prostate cancer patients: an evaluation of suppressor and buffer models. In: Schwartz, C, Sprangers, M. A. G, (Eds), *Adaptation to changing health: response shift in quality-of-life research*. Washington, DC: American Psychological Association, 37–51.

Leventhal, H. & Colman, S. (1997). Quality of life: A process view. *Psychology & Health* [Special Issue: Quality of life: Recent advances in theory and methods], 12, 753-767.

Li, L.,Young, D., Wei, H., Zhang, Y., Zheng, Y., Xiao, S., Wang, X. & Chen, X**.** (1998). The relationship between objective life status and subjective life satisfaction with quality of life. *Behavioral Medicine*, 23, 149-159.

Livneh, H. (2000). Psychosocial Adaptation to Cancer: The role of coping strategies, *Journal of Rehabilitation*, 66, 40- 50.

Lohr, K. N., Aaronson, N. K., Alonso J., Burnam, M. A., Patrick, D. L., Perrin, E. B., and Roberts, J. S. (1996). Evaluating Quality-of-Life and Health Status Instruments: Development of Scientific Criteria. *Clinical Therapeutics*, 18, 979-992.

Markman, M. (1996). Chemotherapy-associated neurotoxicity: an important side effect impacting on quality, rather than quality of life. *Journal of Cancer Research and Clinical Oncology*, 122, 511–512.

Marteau, T. M.& Bekker, H.(1992). The development of a six-item short-form of the state scale of the Spielberger Statet-Trait Anxiety Inventory (STAI). *British Journal of Clinical Psychology,* 31, 301-306.

McNair, P. M, Lorr, M, Droppelman, L. (1971). *Profile of mood states manual*. San Diego: Education and Industrial Testing Service.

McQuellon, R.P., Russell G.B., Cella, D.F., Craven, B. L. Brady, M., Bonomi, A., Hurd, D. D. (1997). Quality of life measurement in bone marrow transplantation: development of the Functional Assessment of Cancer Therapy-Bone Marrow transplantation (FACT-BMT) scale. *Bone Marrow Transplantation*, 19, 357-368.

Meeberg, G. A. (1993). Quality of life: a concept analysis. *Journal of Advanced Nursing*, 18, 32-38.

Meyers, C. A., Weitzner, Byrne, M. K., Valentine, A., Champlin, R. E.& Przepiorka, D. (1994).Evaluation of the neurobehavioral functioning of patients before, during and after bone marrow transplantation. *Journal of clinical oncology,* 12, 820–826.

Meyerowitz, B. E., Henrich, R. L. & Schag, C. C. (1983). A competency-based approach to coping with cancer. In Burish, T. G. & Bradley, L. A.(Eds.), *Coping with Chronic Disease*, (pp. 137-158), New York, Academic Press.

Michalos, A. C. (1986). 'Job satisfaction, marital satisfaction, and the quality of life: A review and prereview', in F.M.Andrews (Ed.), *Research on the Quality of Life.* (pp.57-84) Michigan: Survey Research Center, Institute for Social Research, University of Michigan.

Molassiotis, A., van den Akker, O. B., Milligan, D. W. & Boughton, B. J. (1995). Gonadal function and psychosexual adjustment in male long-term survivors of bone marrow transplantation. *Bone Marrow Transplantation***,**16, 253–259

Molassiotis, A.,O.B.A. van den Akker, O. B. A., Milligan, D. W., Goldman, J. M., Boughton, B.,J., Holmes, J. A. & Thomas, S. (1996). Quality of life in long-term survivors of marrow transplantation: comparison with a matched group receiving maintenance therapy. *Bone Marrow Transplantation,*17, 249–258.

Mumma, G. H., Mashberg, D. & Lesko, L. M. (1992). Long-term psychosexual adjustment of acute leukemia survivors: impact of marrow transplantation versus conventional chemotherapy. *General Hospital Psychiatry*, 14, 43–55.

Musschenga, A. W.(1997). The relation between concepts of Quality -of-Life , health and happiness. *The Journal of Medicine and Philosophy*, 22, 11-28.

Nelson, D. V., Baer, P. E. & Cleveland, S. E. (1998). Family stress management following acute myocardial infarction: an educational and skills training intervention program. *Patient Education and Counseling,* 34, 135–145.

Northouse, P. G. & Northouse, L. L. (1988). Communication and cancer: issues confronting patients, health professionals, and family members. *Journal of Psychosocial Oncology,* 5, 17-46.

Nunnally, J. C. (1978). *Psychometric theory*, New york, McGraw-Hill.

O'Boyle, C. A., McGee, H., Hickey, A., O'Malley, K. and Joyce, C. R., (1992). Individual quality of life in patients undergoing hip replacement. *Lancet*, 339, 1088–1091.

Ordway, S. H. (1953). *Resources and the American dream*, New York, The Ronald Press Company.

Osborn, H. F. (1957). *The limits of earth*, London, Faber & Faber.

Ormel J, Lindenberg, S, Steverink, N, Vonkorff, M. (1997). Quality of life and social production functions; a framework for understanding health effects. *Social Science and Medicine*, 45, 1051-63.

Pais-Ribeiro, J. L. (2004), Quality of life is a primary end-point in clinical settings. Clinical Nutrition, 23, 121-130.

Peteet, J. R. (2000). Cancer and the meaning of work. *General Hospital Psychiatry*, 22. 200- 205.

Puska, P., Tuomilehto, J., Nissinen A. & Vartiainen, E.(Eds.) (1995). *The North Karelia Project.* The National Public Health Institute, Helsinki

Pedhazur, E. J & Pedhazur-Schmelkin, L. (1991). *Measurement, Design and Analysis: An Intergrated Approach.* Lawrence Erlbaum Associates Inc., New Jersey.

Postulart, D. & Adang, E. M. (2000). Response shift and adaptation in chronically ill patients. *Medical Decision Making*, 20,186–193.

Prieto, J. M., Saez, R., Carreras, E., Atala, J., Sierra, J., M. Rovira, Battle, M.,. Blanch, J. Escobar, R. Vieta, E. Gomez, E. Rozman C. & E. Cirera. (1996). Physical and psychosocial functioning of 117 survivors of bone marrow transplantation. *Bone Marrow Transplantation*, 17, 1133–1142.

Raitasalo, R. (1977). *Depression and its connections with need for psychotherapy*. Helsinki: Research Institute for Social Security.

Renwick, R. & Brown, I., (1996). The center for health promotion's conceptual approach to quality of life: being, belonging and becoming. pp. 75–88, In: Renwick, R., Brown, I. and Nagler, M., (Eds), *Quality of Life in Health Promotion and Rehabilitation*, Thousand Oaks, CA, Sage.

Revenson, T. A., Schiaffino, K. M, Majerovitz, S.D. & Gibofsky, A. (1991). Social support as a double-edged sword: The relation of positive and problematic support to depression among rheumatoid arthritis patients. *Social Science & Medicine*, 33, 807-813.

Revicki, D. A., Osoba, D., Faiclough, D., Barofsky, I., Berzon, R., Leidy, N. K. & Rothman, M. (2000). Recommendations on health-related quality of life research to support labeling and promotional claims in United States. *Quality of Life Research*, 9, 887–900.

Rockey P. H., Griep, R. J. (1980). Behavioral dysfunction in hyperthyroidism: improvement with treatment. *Archives of internal medicine*,140, 1194-7.

Romney, D.M., Brown, R. I. & Fry, P. S. (1994). Improving the quality of life: prescriptions for changes. *Social Indicators Research* 33, 237–272.

Rowland, J. H. (1989). Developmental stage and adaptation: adult model. In Holland, J. C. & Rowland, J. H. (Eds) *Handbook of Psychooncology, Psychological care of the patient with cancer*, pp. 25-43. New York, Oxford University Press.

Rowland, J. H. (1989). Interpersonal Resources: Social support. In Holland, J. C. & Rowland, J. H. (Eds.), *Handbook of Psychooncology, Psychological care of the patient with cancer*, (pp. 58- 71). New York, Oxford University Press.

Ruutu, T. (2000). Luuytimen ja veren kantasolujen siirrot veritautien hoidossa.
In Ruutu, T, Rajamäki, T. & Krusius, T (Eds.), *Veritautikirja*, (pp. 423-433). Kustannus Oy Duodecim.

Salander, P. (2002). Bad news from the patient's perspective: an analysis of the written narratives of newly diagnosed cancer patients, *Social Science and Medicine*,55, 721-732.

Sarason, I. G., Sarason, B. R., Shearin, E. N. & Pierce, G. R. (1987), A Brief measure of social support: Practical and theoretical implications. *Journal of Social and Personal Relationship* s, 4, 497-510.

Schafer, W. D.(1991). Reporting hierarchical regression results. *Measurement & Evaluation in Counselling & Development*, 24, 98-101.

Schalock, R. L. & Faulkner, E. H. (1997). Cross-validation of a contextual model of quality of life, *European Journal of Mental Disability*, 4, 18-27.

Schalock, R. L., Bonham, G.S. & Marchand, C. B. (2000). Consumer based quality of life assessment: a path model of perceived satisfaction. *Evaluation and Program Planning*, 23, 77-87.

Schmidt, G. M., Niland, J. C., Forman, S. J., Fonbuena, P. P., Dagis, A.C., Grant, M. M., Ferrell, B. R., Barr, T. A., Stallbaum, B. A., Chao, N. J. & Blume, K. G. (1993). Extended follow-up in 212 long-term allogeneic bone marrow transplant survivors. *Transplantation*, 55, 551-557.

Schwarz, N. & Clore, G. L.(1983). Mood, misattribution and judgments of well-being: informative and directive functions of affective states. *Journal of Personality and Social Psychology*, 45, 513-523.

Scott, C.B. (1998). Issues in quality of life assessment during cancer therapy. *Seminars in radiation oncology*, 8 (4 suppl), 5-9.

Sen, A. (1992). 'Capability and well-being', In Sen A. & Nussbaum M.(Eds.). *The quality of life*, pp. 30-53. Oxford, UK, Clarendon Press.

Shacham, S. (1983). A shortened version of the Profile of Mood States. *Journal of Personality Assessment*, 47, 3.

Sherbourne, C.D. & Stewart, A.L. (1991). The MOS Social support survey. *Social Science and Medicine*, 32, 705-714.

Shumaker, S. A. & Hill, D. R. (1991). Gender differences in social support and physical health. *Health Psychology*, 10, 102-111.

Skevington, S. M., Bradshaw, J. & Saxena, S. (1999). Selecting national items for the WHOQOL: conceptual and psychometric considerations. *Social Science and Medicine*, 48, 473-487.

Smith, K. W., Avis, N. E. & Assmann, S. F. (1999). Distinguishing between quality of life and health status in quality of life research: a meta-analysis. *Quality of Life Research*, 8, 447-459.

Sneeuw, K. C. A., Aaronson, N. K., Sprangers, M. A. G., Detmar, S. B., Wever, L. D. V. and Schornagel, J. H. (1997). The value of caregiver ratings in evaluating the quality of life of patients with cancer. *Journal of Clinical Oncology***,** 15: 1206–1217.

Somerfield, M. R., Curbow, B., Wingard, J. R, Baker, F. and Fogarty, L. A. (1996). Coping with the physical and psychosocial sequelae of bone marrow transplantation among long-term survivors. *Journal of Behavioral Medicine*, 19, 163-84.

Specht, L., Gray, R.G., Clarke, M.J. and Peto R. (1998). Influence of more extensive radiotherapy and adjuvant chemotherapy on long-term outcome of early-stage Hodgkin's disease: a meta-anlaysis of 23 randomized trials involving 3.888 patients. International Hodgkin's Disease Collaborative Group. *Journal of clinical oncology*, 16, 830–843.

Spilker, B. (1990). *Quality of life assessment in clinical trials*. New York: Raven Press.

Sprangers, M. A., Velde, A. T. E. & Aaronson, N. K.(1999), The Construction and Testing of the EORTC Colorectal Cancer-specific Quality of Life Questionnaire Module (QLQ-CR38). *European Journal of Cancer*, 35, 238-247.

Sprangers, M. A. & Schwartz, C.E. (1999). Integrating response shift into health-related quality of life research: a theoretical model. *Social Science and Medicine*, 48**,**1507–1515.

SPSS® Base 9.0 (1999). *Applications Guide*, Chicago, SPSS Inc.

Stalfelt, A.M, Brodin, H and Wadman, B. (1994). Cost analysis of different phases of acute myeloid leukaemia. *Leukemia. Research,*18, 783–790.

Sutherland, H. J., Fyles, G. M., Adams, G. Hao, Y., Lipton, J. H., Minden, M. D., Meharchand, J. M., Atkins H., Tejpar, I.& Messner, H. A. (1997). Quality of life following bone marrow transplantation. *Bone Marrow Transplantation*, 19, 1129-1136.

Syrjälä, K. L., Chapko, M. K., Vitiliano, C. & Sullivan K. M. (1993). Recovery after allogeneic marrow transplantation:prospective study of predictors of long-term physical and psychosociasl functioning. *Bone Marrow Transplantation*, 11, 319-327.

Syrjala, K. L., Roth-Roemer, S.I, Abrams, J. R., Scanlan, J. M., Chapko, M. K., Visser, S. & Sanders, J.E. (1998). Prevalence and predictors of sexual dysfunction in long-term survivors of marrow transplantation. *Journal of Clinical Oncology*, 16, 3148-57.

Taylor, S. E. (1981). The interface of cognitive and social psychology. In Harvey, J. (Ed), *Cognition, Social Behaviour and the Environment*. Hillsdale, New Jersey: Erlbaum.

Taylor, S. E. (1983). Adjustment to threatening events. A theory of cognitive adaptation. *American Psychology*, 38, 1161-73.

Toseland, R. W., Blanchard, C. G. McCallion P. (1995). A problem solving intervention for caregivers of cancer patients *Social .Science and .Medicine*. 40, 517-528.

Trochim, W.M.K., and Linton R. (1986). Conceptualization for planning and evaluation. *Evaluation and Program Planning*, 9, 289-308.

Trochim, W. M. K. (1989). An introduction to concept mapping for planning and evaluation. *Evaluation and Program Planning*, 12, 1-16.

Trochim, W. M. K. (1995). *The concept system*. Ithaca, NY: Concept Systems.

Trochim, W. M. K., Cook, J. A., & Setze, R. J. (1994). Using concept mapping to develop a conceptual framework of staff's views of a supported employment program for individuals with severe mental illness. *Journal of Consulting and Clinical Psychology*, 62, 766-775.

Tschuschke, V. Hertenstein, B. Arnold, R. Bunjes, D. Denzinger, R. & Kaechele, H.(2001). Associations between coping and survival time of adult leukemia patients receiving allogeneic bone marrow transplantation: Results of a prospective study. *Journal of Psychosomatic Research,* 50, 277-285.

Turk, D. C., Sobel, H. J.,Follick, M. J. and Youkilis, H. D. (1980). A sequential criterion analysis for assessing coping with chronic illness, *Journal of Human Stress*, 6, 35-40.

Turner, H. A. (1994).Gender and social support: Taking the bad with the good? Sex roles, 30, 521-541.

Uutela, A., & Aro, A. R. (1993). Koettu ja havaittu elämänlaatu - tosiaan täydentävät näkökulmat [Perceived and observed quality of life - two complementary approaches, in Finnish]. Duodecim, 109, 1507-1511

Veenhoven, R. (1991). 'Is happiness relative?', *Social Indicators Research*, 24, 1-34.

Veenhoven , R. (1999). The four qualities of life, Ordering Concepts and Measure of Good Life. *Journal of Happiness Studies*, 1, 1-39.

Visser, M. R. M, Smets, E. M. A, Sprangers, M. A.G and de Haes, H. J. C. M. (2000). How Response Shift May Affect the Measurement of Change in Fatigue. *Journal of Pain and Symptom Management*, 20, 12-18

Ware, J. E. Jr, & Sherbourne, C. D. (1992), The MOS 36-item short-form health survey (SF-36). I.Conceptual framework and item selection. *Medical Care*, 30, 473-83.

Watson, M., Wheatley, K., Harrison, G. A., Zittoun, R., Gray, R. G., Goldstone A. H., Burnett, A.K.(1999). Severe adverse impact on sexual functioning and fertility of bone marrow transplantation, either allogeneic or autologous, compared with consolidation chemotherapy alone: analysis of the MRC AML 10 trial. *Cancer,* 86**,** 1231–1239.

Watson, M., Buck, G., Wheatley, K., Homewood, J.R., Goldstone, A. H., Rees, J. K. & Burnett, A. K. (2004). Adverse impact of bone marrow transplantation on quality of life in acute myeloid leukaemia patients; analysis of the UK Medical Research Council AML 10 Trial. *European Journal of Cancer*, 40, 971-8.

WHO (World Health Organization), 1947. In: *The cronicle of the WHO* Vol. 1, WHO, Geneva.

WHOQOL Group (1994). Development of the WHOQOL: rationale and current status, *International Journal of Mental Health*, 23, 24–56.

Wiebe, S., Guyatt, G., Weaver, B.,Matijevic, S.and Sidwell, C. (2003).
Comparative responsiveness of generic and specific quality-of-life instruments. *Journal of Clinical Epidemiology*, 56, 52-60.

Winer, E. P.(1994), Quality of Life After Bone Marrow Transplantation. *Oncology*, 8, 19-25.

Wingard, J. R, Curbow, B.,Baker, F., Zabora, J. & Piantadosi, S (1992), Sexual satisfaction in survivors of bone marrow transplantation. *Bone Marrow Transplantation***,** 9, 185–190.

Wood, L. F. (1994) My life in their hands: getting cancer gave me a totally different viewpoint. *BMA News Review*, September, 34.

Wortman, C.B. (1984). Social support and the cancer patient. Conceptual and methodologic issues. *Cancer*, 53, 2339-2360.

Zack, M. M., Moriarty, D. G., Stroup, D. F., Ford, E. S. & Mokdad, A. H. (2004). Worsening trends in adult health-related quality of life and self-rated health—United States, 1993–2001. *Public Health Reports*, 119, 493-505.

Zittoun, R., Suciu, S. & Watson, M. (1997). Quality of life in patients with acute myelogenous leukemia in prolonged first complete remission after bone marrow transplantation (allogeneic or autologous) or chemotherapy: a cross-sectional study of the EORTC-Ginema AML 8A trial. *Bone Marrow Transplantation*, 20, 307-315.

Appendix 1

Clusters and stress items

Cluster 1 **Change of life and long-lasting treatment**

	Frequency	Intensity	Controllability
	Mean (s.d)		
1. It is difficult to come to the clinic	2.5 (1.1)	2.4 (1.2)	2.2 (1.2)
15. Limitations of life after discharge from the hospital	3.1 (1.3)	2.9 (1.2)	2.5 (1.0)
24. The complete change in life	2.8 (1.4)	2.7 (1.3)	2.5 (1.1)
19. Endurance is on the lower level than it used to be	3.2 (1.1)	2.9 (1.3)	2.5 (1.1)
33. It was a shock to become ill	3.5 (1.5)	4.1 (1.1)	3.2 (1.4)
41. Long lasting treatment	3.5 (1.3)	3.4 (1.1)	3.0 (1.2)
78. It was to travel	2.8 (1.4)	2.8 (1.2)	2.5 (1.1)
98. Fed up with long-lasting hospitalization	3.1 (1.3)	3.1 (1.2)	2.7 (1.1)
Total	Frequency + Intensity + Controllability = 2.9(0.7)		

Cluster 2 **Side-effects**

	Frequency	Intensity	Controllability
	Mean (s.d)		
6. Vomiting during the treatment	3.3 (1.5)	3.1 (1.4)	3.1 (1.4)
9. Lack of appetite	3.4 (1.59)	3.1 (1.4)	2.9 (1.3)
16. Changes in sense of taste	2.9 (1.4)	2.6 (1.3)	2.3 (1.2)
20. Nervous about test results	3.1 (1.3)	3.0 (1.3)	2.5 (1.2)
28. Fear of recurrence of the disease	3.1 (1.3)	3.0 (1.2)	2.7 (1.2)
31 Change of appearance	2.9 (1.5)	2.6 (1.3)	2.4 (1.3)
49. Limitations on eating	2.6 (1.3)	2.3 (1.1)	2.3 (1.2)
54. Recovery of physical condition was slow	3.3 (1.4)	3.1 (1.2)	2.8 (1.1)
97. Diarrhea	2.8 (1.3)	2.8 (1.2)	2.7 (1.1)
Total	Frequency + Intensity + Controllability = 2.8(0.7)		

Cluster 3 **Family related stress**

	Frequency	Intensity	Controllability
	Mean (s.d)		
2. The family /and friends had difficulties visiting due to the long distance from home	2.7 (1.5)	2.4 (1.3)	2.1 (1.2)
3. The fear about the future gnaws the family	3.5 (1.3)	3.4 (1.1)	2.7 (1.0)
11. Worries about the well-being of the family	3.2 (1.4)	2.9 (1.3)	2.5 (1.1)
25. The worries about children's future	3.0 (1.6)	2.9 (1.5)	2.4 (1.2)
37. It was difficult for the family to bear the diagnosis	3.2 (1.3)	3.2 (1.2)	3.0 (1.2)
51. Feeling that family is sometimes overprotective	2.2 (1.2)	2.1 (1.1)	2.1 (1.1)
52. Not enough rehabilitation support	2.5 (1.6)	2.3 (1.5)	2.5 (1.4)
67. Closest relatives were stressed	2.8 (1.2)	2.8 (1.2)	2.6 (1.1)
96. Long-lasting illness puts heavy demands on economic-situation	3.0 (1.4)	2.8 (1.3)	2.6 (1.2)
Total	Frequency + Intensity + Controllability = 2.7(0.7)		

Cluster 4 **Distress related to treatment outcome and physiological status**

	Frequency	Intensity	Controllability
	Mean (s.d)		
4. Difficulties in sleeping	2.6 (1.5)	2.5 (1.4)	2.6 (1.3)
5. Constant uncertainty	3.1 (1.2)	3.0 (1.1)	2.5 (1.1)
7. Worry about how the stem cell graft will grow	3.1 (1.4)	2.9 (1.3)	2.6 (1.2)
10. Excitement (nervousness) related to blood counts	3.5 (1.3)	3.2 (1.2)	2.7 (1.2)
1 2. Constant monitoring of fever makes nervous	2.4 (1.3)	2.3 (1.6)	2.2 (1.2)
14. It was exciting to get home from hospital	2.7 (1.3)	2.6 (1.2)	2.3 (1.2)
17. Tastes became sensitive	2.4 (1.3)	2.3 (1.2)	2.3 (1.2)
23. Feelings of helplessness during the treatment	3.1 (1.3)	2.9 (1.2)	2.7 (1.1)
27. Feelings that one will never be the same	3.0 (1.5)	2.8 (1.3)	2.5 (1.2)
29. Possibility of severe infectious, the uncontrollability caused fear	3.0 (1.3)	3.0 (1.2)	2.8 (1.1)
36. Fear of the future	3.3 (1.4)	3.2 (1.2)	2.8 (1.2)
42. Irritated feelings	2.8 (1.2)	2.7 (1.2)	2.6 (1.0)
45. The lack of ability to concentrate during the treatment	2.5 (1.4)	2.4 (1.3)	2.5 (1.1)
46. Weaker memory during the treatment	2.4 (1.3)	2.5 (1.3)	2.5 (1.3)
57. One could not help thinking of illness	3.3 (1.4)	3.0 (1.2)	2.7 (1.2)
58. Emphasised self monitoring	3.1 (1.2)	2.8 (1.1)	2.4 (1.0)
63. Physical deterioration	3.1 (1.4)	3.0 (1.2)	2.7 (1.1)
73. Swelling caused by cortisone was shocking, one could not recognise him/herself	2.8 (1.4)	2.8 (1.4)	2.5 (1.3)
74. It was difficult to realise how weak one's physical condition became	3.4 (1.2)	3.4 (1.1)	3.0 (1.2)
95. Tiredness, (dead tired)	2.8 (1.4)	2.8 (1.4)	2.6 (1.2)
Total	3.2(0.9)	2.9(0.7)	2.6(.1.2)
Total	Frequency + Intensity + Controllability = 2.8(0.7)		

Cluster 5 **Other concerns**

	Frequency	Intensity	Controllability
	Mean (s.d)		
32. Difficult position during irradiation	2.2 (1.3)	2.3 (1.4)	3.2 (1.4)
62. One did not want to go out because of appearance	2.4 (1.5)	2.4 (1.4)	2.3 (1.3)
79. Shortly after the discharge one is slightly afraid of how to manage at home	2.6 (1.1)	2.5 (1.1)	2.3 (1.0)
80. At the beginning hygiene overemphasized at home	2.6 (1.2)	2.6 (1.2)	2.3 (1.0)
82. Problems in sexuality	2.4 (1.2)	2.4 (1.2)	2.4 (1.2)
84. Conflicting thoughts and worries about the transplantation	2.7 (1.4)	2.9 (1.3)	2.6 (1.1)
86. Living only intervals of controls	2.4 (1.3)	2.4 (1.1)	2.3 (1.1)
94. Worries about having children	1.9 (1.4)	1.9 (1.4)	2.1 (1.4)
Total	3.1 (0.8)	2.8 (0.8)	2.6 (0.7)
Total	Frequency + Intensity + Controllability =2.3 (0.6)		

Cluster 6 **Stress related to the medical staff**

	Frequency	Intensity	Controllability
	Mean (s.d)		
8. During isolation nurses did not have enough time to discuss	2.8 (1.3)	2.5 (1.1)	2.5 (1.2)
18. Side-effects and problems were emphasized when the treatment was described	2.5 (1.2)	2.5 (1.1)	2.4 (1.2)
34. Patient's feelings were not considered, when the diagnosis was told	2.4 (1.4)	2.8 (1.59	2.9 (1.3)
53.Feeling that the doctor does not meet the patient as a person but rather as a file	2.1 (1.3)	2.1 (1.2)	2.3 (1.2)
56. Constant turnover of physicians at the department	2.7 (1.3)	2.6 (1.2)	2.5 (1.2)
59. During the doctor's rounds one felt like being a fly under magnifying	2.2 (1.2)	2.1 (1.1)	2.1 (1.1)
66. The negative prognoses given by physicians	2.1 (1.2)	2.6 (1.4)	2.6 (1.2)
68. Need for discussion with a fellow sufferer	2.8 (1.4)	2.6 (1.4)	2.2 (1.1)
69. Need for more information about the transplant	2.3 (1.3)	2.3 (1.2)	2.4 (1.1)
70. Not enough written information available	2.3 (1.3)	2.3 (1.2)	2.4 (1.1)
71. At the beginning I did not know what to ask from the physician	2.6 (1.3)	2.5 (1.2)	2.4 (1.1)
75. Lack of own physician	2.2 (1.2)	2.3 (1.1)	2.3 (1.1)
76. Training on human relationships among physicians insufficient	2.2 (1.2)	2.2 (1.2)	2.4 (1.2)
81. "Top" physicians of the department seldom available	2.2 (1.1)	2.0 (1.0)	2.3 (1.2)
83. Conflicts between opinions among physicians	1.6 (.1)	1.7 (.9)	2.0 (1.1)
88. Lack of confident patient-physician relationship	1.7 (1.0)	1.8 (1.0)	1.9 (1.0)
89. After the diagnosis no experts available to be turned to	2.0 (1.3)	2.1 (1.4)	2.3 (1.3)
Total	2.9(0.8)	2.8(0.8)	2.4(0.7)
Total	Frequency + Intensity + Controllability = 1.8 (0.6)		

Cluster 7 **Loneliness and depressive thought**

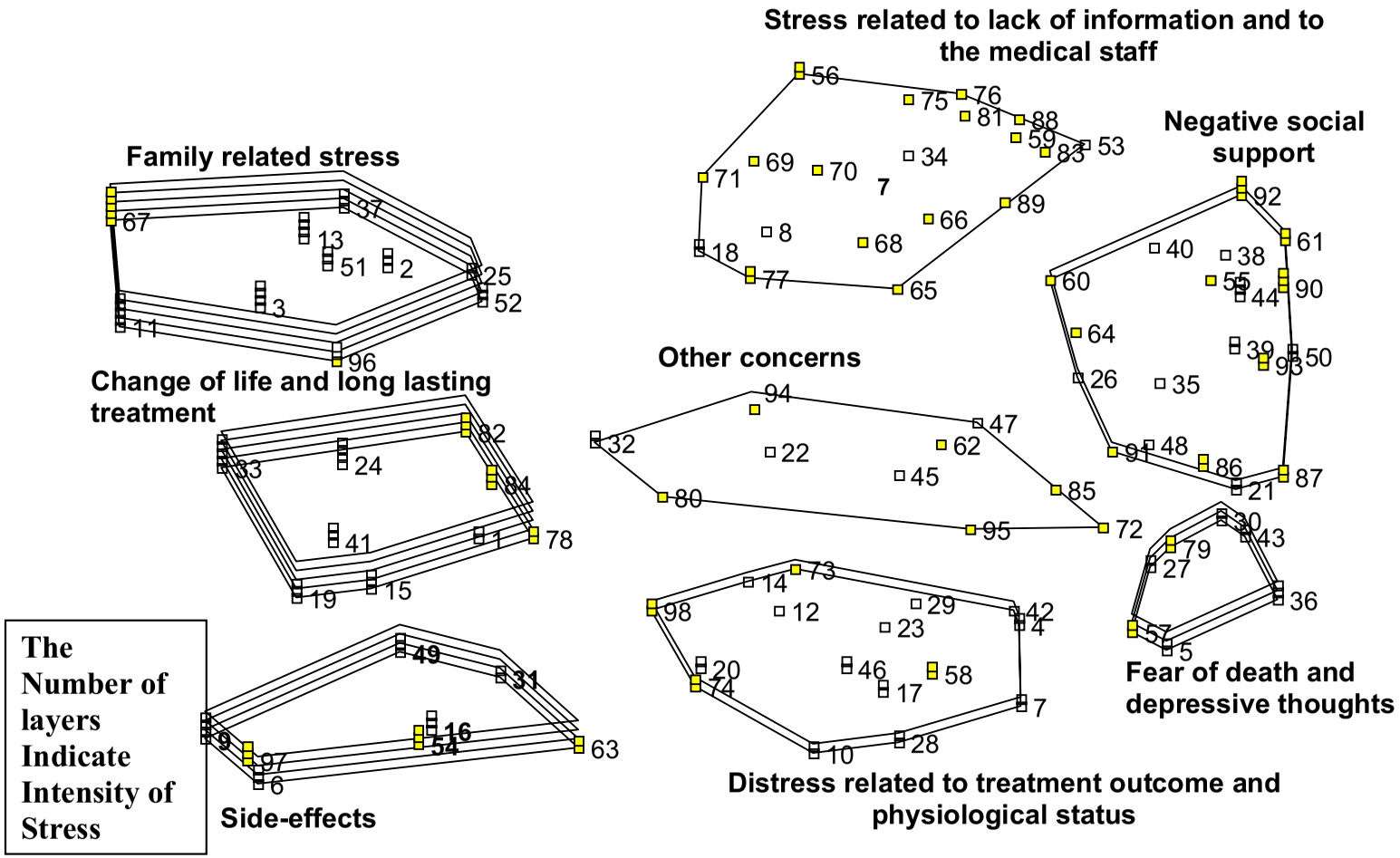
	Frequency	Intensity	Controllability
	Mean (s.d)		
21. Fear of death	2.6 (1.3)	2.5 (1.2)	2.4 (1.3)
22. Uncertainty of finding a donor	2.5 (1.4)	2.6 (1.3)	2.3 (1.2)
30. Feeling useless	2.4 (1.4)	2.3 (1.3)	2.4 (1.2)
43. Feelings of hatred and anger	2.6 (1.3)	2.5 (1.2)	2.5 (1.1)
47. Feeling like I had leprosy when isolated	2.1 (1.3)	2.0 (1.2)	2.1 (1.2)
48. Feeling of losing one's independence in isolation	2.2 (1.4)	2.1 (1.2)	2.3 (1.2)
72. Feeling of loneliness	2.8 (1.4)	2.8 (1.3)	2.6 (1.2)
85. Fear of losing one's mind	1.6 (1.1)	1.6 (1.1)	1.8 (1.1)
87. Fear to go to the clinics	2.0 (1.2)	2.1 (1.1)	2.2 (1.2)
91. Feeling of giving up	1.7 (1.2)	1.9 (1.2)	2.1 (1.2)
Total	2.3 (0.8)	2.3 (0.8)	2.3 (0.7)
Total	Frequency + Intensity + Controllability = 2.3 (0.7)		

Cluster 8 **Negative social support**

	Frequency	Intensity	Controllability
	Mean (s.d)		
26. Feeling of being a burden to others	2.6 (1.3)	2.5 (1.2)	2.4 (1.1)
35. The word cancer was difficult to say aloud	2.7 (1.5)	2.8 (1.5)	2.3 (1.6)
38. The friends started to avoid	1.7 (1.2)	1.8 (1.1)	2.1 (1.3)
39. Having others feel sorry for you was bad	2.3 (1.2)	2.3 (1.2)	2.3 (1.1)
40. Unmet needs for a true/honest friendship	2.5 (1.4)	2.2 (1.1)	2.2 (1.1)
44. Alienation from the family	1.8 (1.2)	1.8 (1.1)	2.0 (1,1)
50. "Doubt" about acceptance when going back home	1.9 (1.1)	1.9 (1.1)	2.0 (1.0)
55. Fellow workers were monitoring how I am doing	1.8 (1.1)	1.9 (1.2)	2.0 (1.2)
60. I was displaced from the decision making at home	1.3 (.7)	1.4 (.7)	1.7 (1.0)
61. It was difficult for friends to react	2.0 (1.1)	2.0 (1.1)	2.0 (1.1)
64. Wrong kind of understanding by friends was irritating	2.2 (1.3)	2.2 (1.2)	2.2 (1.0)
65. Talking about negative things during hospital visits	2.0 (1.1)	2.2 (1.1)	2.1 (1.0)
77. Other people had fears, they considered the disease "a death penalty"	2.4 (1.3)	2.4 (1.2)	2.2 (1.0)
90. Silence in side the family was terrible	1.6 (1.0)	1.7 (1.1)	2.0 (1.1)
92. Relatives had difficulties to react	1.8 (1.0)	1.9 (1.0)	2.0 (1.1)
93. At the beginning difficult to talk about disease	1.9 (1.2)	1.9 (1.2)	2.0 (1.1)
Total	2.2 (0.8)	2.2 (0.8)	1.3 (0.8)
Total	Frequency + Intensity + Controllability = 2.0 (0.6)		

Intensity Appraisals for Stress Clusters among the Finnish SCT-patients

Figure 1



Appendix 2

Table 1

Frequencies and percentages ( ) of SCT-recipients experiencing "satisfaction with current QOL" after BMT

"Satisfaction with current QOL"	Time after BMT (months) ≤12	13-36	37-60	>60
not at all/ a little	3 (16.7)	3 (10.7)	1 (4.3)	3 (8.1)
somewhat	6 (33.3)	3 (10.7)	3 (13.0)	4 (10.8)
much/ very much	9 (50.0)	22 (78.6)	19 (82.6)	30 (81.1)
n	18	28	23	37

Number of Missing Observations: 3 (χ^2= 8.47 d.f.= 6, p = .80$^{ns.}$)

Table 2
Frequencies and percentages ( ) of SCT-recipients "feeling lack of energy", bothered by side-effects", "sleeping well" after SCT

"feeling lack of	Time after BMT (months)				
Energy"	≤12	13-36	37- 60	>60	Total
Not at all/ a little	7 (38.9)	17 (58.6)	16 (69.6)	28 (75.7)	68 (63.6)
Somewhat	5 (27.8)	9 (31.0)	6 (26.1)	7 (18.9)	27 (25.2)
Much/very much	6 (33.3)	3 (10.3)	1 (4.3)	2 (5.4)	12 (11.2)
"bothered by					
Side-effects"					
Not at all/ a little	8 (44.4)	22 (75.9)	16 (69.9)	33 (89.2)	79 (73.8)
Somewhat	3 (16.7)	4 (13.8)	4 (17.4)	2 (5.4)	13 (12.1)
Much/ very much	7 (38.9)	3 (10.3)	3 (13.0)	2 (5.4)	15 (14.9)
"sleeping well"					
Not at all/ a little	4 (22.2)	2 (6.9)	1 (4.3)	2 (5.4)	9 (8.4)
Somewhat	4 (22.2)	2 (9.9)	4 (17.4)	6 (16.2)	16 (15.0)
Much/ very much	10 (55.6)	25 (86.2)	18 (78.4)	29 (78.4)	82 (76.6)
n	18 (16.8)	29 (27.1)	23 (21.5)	37 (34.6)	107 (100)

Table 3 Gender differences in HRQOL of the SCT patients (n= 109)

	Males	Females	
Dimension	Mean (s.d.) n= 48	Mean (s.d.) n= 61	F-value
FACT-Physical	23.8 (3.9)	22.9 (5.7)	0.8^{ns}
FACT-Emotional	22.9 (5.7)	15.8 (3.0)	5.2*
FACT-Social	21.6 (4.2)	21.9 (3.9)	0.3^{ns}
FACT-Functional	22.6 (3.14)	22.4 (5.3)	0.0^{ns}
FACT-BMTS	38.6 (4.2)	35.6 (6.1)	8.6**
FACT-TOI	85.1 (9.6)	81.0 (15.7)	2.5^{ns}
ADL	34.8 (2.6)	33.7 (4.0)	2.9^{ns}
Karnofsky scale	95.8 (6.9)	94.8 (9.4)	0.3^{ns}
POMS-Depression	4.5 (4.2)	5.9 (5.9)	1.8^{ns}
POMS-Anxiety	7.6 (4.1)	8.3 (4.7)	0.6^{ns}
POMS-Fatigue	5.3 (4.0)	7.7 (5.1)	7.3**
POMS-Anger	6.4 (3.8)	7.5 (4.8)	1.6^{ns}
POMS-Confusion	5.1 (3.0)	5.1 (3.2)	0.0^{ns}
POMS-TMD	36.7(16.0)	42.3 (22.5)	2.1^{ns}
SSQ6	31.5 (4.5)	33.1 (3.0)	4.8*
MOS	74.6 (11.7)	74.6 (11.3)	0.2^{ns}

p*<.05, p**<.01

FACT-BMTS= bone marrow transplantation subscale, FACT-TOI= treatment outcome index, POMS-TMD= total mood disturbance scale, SSQ6=satisfaction with social support, MOS= availability of social support

Table 4 Correlation coefficients between the well-being variables and the follow-up time, cGVHD, TBI, current age, age at SCT, education, marital status, satisfaction with social support, and availability of social support among SCT patients (n= 109)

		PWB	FWB	EWB	SWB	TMD	Sleeping	Tiredness	Sexual satisfaction[1]
Follow-up time	Male	.42**		.29*			.32*	-.48**	.36*
	Female	.36**							
cGVHD	Male								-.49**
	Female			-.30*					
TBI	Male								
	Female								
Current age	Male				.40**				
	Female						-.31*		-.32*
Age at SCT	Male				.43**				-.39*
	Female	-.37**	-.26*				-.30*		-.37**
Education	Male								
	Female							-.33**	
Marital status	Male				-.57***				
	Female								
SSQ6	Male					-.27*			.
	Female				.64***	-.27*			
MOS	Male				.72***				
	Female				.49***				

Correlation coefficients .20 or more are presented
p*<.05, p**<.01, p***<.001
[1] Correlation coefficients only among participants married/living with mate are presented
PWB = physical well-being (FACT), FWB = functional well-being (FACT), EWB = emotional well-being (FACT)
SWB = social well-being (FACT), TMD = Total mood disturbance scale (POMS), SSQ6 = satisfaction with social support,
MOS = Availability of social support, Marital status 1 = married, 2 = unmarried, cGVHD 1 = absent, 2 = limited, 3 = extensive
TBI = total body irradiation, 1 = received, 2 = not received

Table 5 Correlation coefficients between VAS-scores and well-being measures (n= 3838)

Gender	STAI		BDI		PWB		Nr. Dis.		FWB		ADL		SSQ6		Family		Achieve		Economic	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
VAS-QOL	-.61	-.59	-.59	-.57	-.35	-.29	-.13	-.13	-.29	-.27	.20	.18	-.07	.03	-.27	-.27	.40	.33	-.35	-.28
STAI			.67	.64	.29	.24	.11	.10	.26	.24	-.11	-.11	.09	-.01	.23	.30	-.35	-.30	.28	.25
BDI					.42	.37	.25	.20	.35	.31	-.29	-.27	.09	-.07	.25	.34	-.34	-.33	.25	.23
PWB							.45	.43	.69	.57	-.47	-.49	-.02	-.09	.15	.15	-.23	-.22	.19	.13
Nr. dis.									.28	.25	-.38	-.42	-.05	-.03	.02	.11	-.04	-.06	.02	.04
FWB											-.40	-.43	-.00	-.05	.10	.12	-.21	-.20	.17	.16
ADL													.08	.05	-.10	-.11	.10	.13	-.08	-.05
SSQ6															.19	.04	-.04	.02	.05	-.00
Family																	-.36	-.34	.21	.22
Achieve																			-.53	-.44

VAS-QOL= VAS for global QOL STAI= State anxiety scale BDI= Depressive symptoms PWB= Physical well-being (FACT)
Nr.dis.= Number of diseases FWB= Functional well-being (FACT) ADL= Activities of daily living scale
SSQ6= availability of social support Family = Satisfaction with family life Achieve= satisfaction with life achievements
Economic= Satisfaction with economic situation, Correlation coefficients >.07 statistically significant p<.01
males n= 1771, females= 2067

Table 6 Summary of hierarchical regression analysis for variables predicting GQOL among Finnish males

Predictor	Std β Step 1	Std β Step 2	Std β Step 3	Std β Step 4	Std β Step 5	Std β Step 6	ΔR^2 (increment)	Collinearity statistics at 6th step 1-tolerance=R^2_1
1. Sociodemographics							.05***	
age	.04	.12**	.12**	.13***	.11***	.11**		45%
education	-.01	-.04	-.04	-.02	-.01	.02		31%
income	.11*	.06	.06	.05	.01	.02		46%
work status	-.11**	-.07*	-.06*	-.05	-.04	-.02		40%
marital status	-.10**	-.09**	-.09**	.10**	.08	.03		56%
2. Physical well-being							.10***	
Perceived physical health		-.34***	-.27***	-.24***	-.20***	-.09**		57%
Number of diseases		-.01	-.01	-.00	-.01	.01		28%
3. Functional well-being							.01**	
Perceived physical condition			-.10**	-.10**	-.07*	-.02		46%
ADL			.01	.02	.04	.03		34%
4. Social well-being							.04***	
SSQ6				-.03	-.04	-.00		8%
Satisfaction with family life				-.27***	-.17***	-.08***		56%
5. Satisfaction with life achievements					.30***	.15***	.07***	26%
6. Emotional well-being							.22***	
BDI						-.27***		53%
STAI						-.33***		49%

work status and marital status were coded 1= working, married, 2= not working, not married, ADL= Activities of daily living scale, BDI= Depressive symptoms, STAI= State anxiety scale, SSQ6= availability of social support

Note. For the final model F(14, 1490)= 100.3*** R^2= .48 Stepwiseprocedure *p< .05; **p<.01; ***p<.001

Table 7 Summary of hierarchical regression analysis for variables predicting GQOL among Finnish females

Predictor	Std β Step 1	Std β Step 2	Std β Step 3	Std β Step 4	Std β Step 5	Std β Step 6	ΔR^2 (increment)	Collinearity statistics at 6th step 1-tolerance=R^2_I
1. Sociodemographics							.02***	
Age	-.01	.09**	.09**	.13***	.11***	.07**		47%
education	-.03	-.06*	-.06*	-.04	-.05	-.01		33%
income	.12***	.09**	.10**	.08*	.07*	.05		39%
work status	-.01	.02	.03	.04	.06*	.04		26%
marital status	-.06*	-.06*	-.07*	.05	.04	.02		40%
2. Physical well-being							.09***	
Perceived physical health		-.31***	-.22***	-.20***	-.17***	-.08**		48%
Number of diseases		-.04	-.03	-.03	-.04	-.01		25%
3. Functional well-being							.02***	
Perceived physical condition			-.14***	-.12***	-.10***	-.03		37%
ADL			.05	.05*	.05	.02		39%
4. Social well-being							.05***	
SSQ6				.05*	.05*	.03		6%
Satisfaction with family life				-.26***	-.19***	-.10***		36%
5. Satisfaction with life achievements					.23***	.10***	.04***	20%
6. Emotional well-being							.23***	
BDI						-25***		51%
STAI						-.35***		46%

work status and marital status were coded 1= working, married, 2= not working, not married, ADL= Activities of daily living scale, BDI= Depressive symptoms, STAI= State anxiety scale, SSQ6= availability of social support

Note. For the final model F (14, 1772)= 103.8 *** R^2= .45, Stepwiseprocedure *p< .05; **p<.01; ***p<.001

Table 8 Summary of hierarchical regression analysis for variables predicting GQOL among SCT patients with post-SCT time of three years or less

Predictor	Std β Step 1	Std β Step 2	Std β Step 3	Std β Step 4	Std β Step 5	ΔR^2 (increment)
1. Sociodemographics						
Age	-.14	.06	.04	.04	.02	.11
Gender	.07	.17	.19	.20	.18	
Education	-.17	-.10	-.09	-.09	.05	
Income level	.42	.11	.13	.14	-.00	
Marital status	.00	-00	-.02	-.01	-.06	
2. Physical well-being						.50***
FACT-P		.77***	.62***	.62***	.66***	
3. Functional well-being						.03
ADL			.22	.22	.13	
4. Social well-being						
MOS-SS				.01	.07	.00
6. Emotional well-being						.05
POMS-DD					-.44*	
POMS-TA					.28	

F= 6.3*, Adjusted R^2= .58, marital status was coded, 1= married/living with mate, 2= unmarried,
FACT-P= FACT's physical well-being scale, ADL= activities of daily living scale,
MOS-SS= availability of social support, POMS-DD= Profile of mood states, Depresssion,
POMS-TA= Profile of mood states, Tension-anxiety,*p< .05; **p<.01; ***p<.001

Table 9 Summary of hierarchical regression analysis for variables predicting GQOL among SCT patients with post-SCT time of more than three years (n= 61)

Predictor	Std β Step 1	Std β Step 2	Std β Step 3	Std β Step 4	Std β Step 5	ΔR^2 (increment)
1. Sociodemographics						.17
Age	-.12	-.13	-.19	-.13	-.03	
Gender	.09	.08	.05	.10	.18	
Education	.17	.08	.06	.04	.05	
Income level	.29*	.26	.31*	.25	.15	
Marital status	-.05	-.08	-.13	.12	-.01	
2. Physical well-being						.05
FACT-P		.25	.33*	.25	.08	
3. Functional well-being						.01
ADL			-.16	-.07	.03	
4. Social well-being						.14**
MOS-SS				.45**	.25	
6. Emotional well-being						.16**
POMS-DD					-.36*	
POMS-TA					-.18	

F= 5.6*** Adjusted R^2= .44, marital status was coded, 1= married/living with mate, 2= unmarried,
FACT-P= FACT's physical well-being scale, ADL= activities of daily living scale, MOS-SS= availability of social support,
POMS-DD= Profile of mood states, Depresssion, POMS-TA= Profile of mood states, Tension-anxiety *p< .05; **p<.01; ***p<.001